165 170 175

Lys Lys Glu Asn Gly Leu Val Ile Leu Thr Ser His Ile Ser Glu Asp
180 185 190

Ile Ser Asp Leu Cys Thr Asp Val Leu Val Val Glu Asn Gly His Ile
195 200 205

Gln Met
210

<210> 365
<211> 97
<212> PRT
<213> Streptococcus pneumoniae

<400> 365

Met Arg Ser Met Thr Arg Leu Ala Ser Gln Val Ser Ser Phe Pro Cys
1 5 10 15

Phe Thr Phe Ala Lys Cys Phe Ser Lys Ser Ser Lys Leu Lys Leu Asp
20 25 30

Val Lys Lys Val Gly Lys Phe Ser Cys Ile Arg Tyr Trp Arg Met Thr
35 40 45

Cys Arg Ile Ser Ser Arg Thr Gln Thr Val Asp Cys Ser Ala Pro Ile
50 55 60

Ser Ser Lys Ile Arg Thr Ser Asp Ser Leu Ile Ser Ser Thr Lys Val
65 70 75 80

Leu Thr Leu Pro Ser Leu Ile Ala Phe Leu Thr Ser Met Thr Lys Leu
85 90 95

Gly

<210> 366
<211> 501
<212> PRT
<213> Streptococcus pneumoniae

<400> 366

Met Ile Ile Leu Lys Glu Phe Lys Pro Met Ser Leu Leu Val Phe Glu
1 5 10 15

Asn Val Ser Lys Ser Tyr Gly Ala Thr Pro Ala Leu Glu Asn Val Ser
20 25 30

Leu Asp Ile Pro Ala Gly Lys Ile Val Gly Leu Leu Gly Pro Asn Gly
35 40 45

Ser Gly Lys Thr Thr Leu Ile Lys Leu Ile Asn Gly Leu Leu Gln Pro
50 55 60

Asp Gln Gly Arg Val Leu Ile Asn Asp Met Asp Pro Ser Pro Ala Thr
65 70 75 80

Lys Ala Val Val Ala Tyr Leu Pro Asp Thr Thr Tyr Leu Asn Glu Gln
85 90 95

Met Lys Val Lys Glu Ala Leu Thr Tyr Phe Lys Thr Phe Tyr Lys Asp
100 105 110

Phe Asn Leu Glu Arg Ala His His Leu Leu Ala Asp Leu Gly Ile Asp
115 120 125

Glu Asn Ser Arg Leu Lys Lys Leu Ser Lys Glu Asn Lys Glu Lys Val
130 135 140

Gln Leu Ile Leu Val Met Ser Arg Asp Ala Arg Leu Tyr Val Leu Asp
145 150 155 160

Glu Pro Ile Gly Gly Val Asp Pro Ala Ala Arg Ala Tyr Ile Leu Asn
165 170 175

Thr Ile Ile Asn Asn Tyr Ser Pro Thr Ser Thr Val Leu Ile Ser Thr
180 185 190

His Leu Ile Ser Asp Ile Glu Pro Ile Leu Asp Glu Ile Val Phe Leu
195 200 205

Lys Asp Gly Lys Val Val Arg Gln Gly Asn Val Asp Asp Ile Arg Tyr

```
    210                 215                 220

Glu Ser Gly Glu Ser Ile Asp Gln Leu Phe Arg Gln Asn Leu Arg Pro
225                 230                 235                 240

Lys Gln Arg Arg Leu Phe Met Phe Trp Asn Leu Val Arg Tyr Glu Phe
                245                 250                 255

Lys Asn Val Asn Lys Trp Tyr Leu Ala Leu Tyr Ala Ala Val Leu Val
            260                 265                 270

Leu Ser Ala Leu Ile Gly Ile Gln Thr Gln Gly Phe Lys Asn Leu Pro
        275                 280                 285

Tyr Gln Glu Ser Gln Ala Thr Met Leu Leu Phe Leu Ala Thr Val Phe
    290                 295                 300

Gly Gly Leu Met Leu Thr Leu Gly Ile Ser Thr Ile Phe Leu Ile Ile
305                 310                 315                 320

Lys Arg Phe Lys Gly Ser Val Tyr Asp Arg Gln Gly Tyr Leu Thr Leu
                325                 330                 335

Thr Leu Pro Val Ser Glu His His Ile Ile Thr Ala Lys Leu Ile Gly
            340                 345                 350

Ala Phe Ile Trp Ser Leu Ile Ser Thr Ala Val Leu Ala Leu Ser Ala
        355                 360                 365

Val Ile Ile Leu Ala Leu Thr Ala Pro Glu Trp Ile Pro Leu Ser Tyr
    370                 375                 380

Val Ile Thr Phe Val Glu Thr His Leu Pro Gln Ile Phe Leu Thr Gly
385                 390                 395                 400

Ile Ser Phe Leu Leu Asn Thr Ile Ser Gly Ile Leu Cys Ile Tyr Leu
                405                 410                 415

Ala Ile Ser Ile Gly Gln Leu Phe Asn Glu Tyr Arg Thr Ala Leu Ala
            420                 425                 430
```

```
Val Ala Val Tyr Ile Gly Ile Gln Ile Val Ile Gly Phe Ile Glu Leu
        435                 440                 445

Phe Phe Asn Leu Ser Ser Asn Phe Tyr Val Asn Ser Leu Val Gly Leu
    450                 455                 460

Asn Asp His Phe Tyr Met Gly Ala Gly Ile Ala Ile Val Glu Glu Leu
465                 470                 475                 480

Ile Phe Ile Ala Ile Phe Tyr Leu Gly Thr Tyr Tyr Ile Leu Arg Asn
                485                 490                 495

Lys Val Asn Leu Leu
            500
```

<210> 367
<211> 381
<212> PRT
<213> Streptococcus pneumoniae

<400> 367

```
Met Val Thr Pro Phe Val Thr Leu Leu Val Met Ser Ile Leu Gly Leu
1               5                   10                  15

Phe Val Ile Gly Pro Val Phe His Val Val Glu Asn Tyr Ile Leu Ile
            20                  25                  30

Ala Thr Lys Ala Ile Leu Ser Met Pro Phe Gly Leu Gly Gly Phe Leu
        35                  40                  45

Ile Gly Gly Val His Gln Leu Ile Val Val Ser Gly Val His His Ile
    50                  55                  60

Phe Asn Leu Leu Glu Val Gln Leu Leu Ala Ala Asp His Ala Asn Pro
65                  70                  75                  80

Phe Asn Ala Ile Ile Thr Ala Ala Met Thr Ala Gln Gly Ala Ala Thr
                85                  90                  95

Val Ala Val Gly Val Lys Thr Lys Asn Pro Lys Leu Lys Thr Leu Ala
            100                 105                 110
```

```
Phe Pro Ala Ala Leu Ser Ala Phe Leu Gly Ile Thr Glu Pro Ala Ile
        115                 120                 125

Phe Gly Val Asn Leu Arg Phe Arg Lys Pro Phe Phe Leu Ser Leu Ile
    130                 135                 140

Ala Gly Ala Ile Gly Gly Gly Leu Ala Ser Ile Leu Gly Leu Ala Gly
145                 150                 155                 160

Thr Gly Asn Gly Ile Thr Ile Ile Pro Gly Thr Met Leu Tyr Val Gly
                165                 170                 175

Asn Gly Gln Leu Pro Gln Tyr Leu Leu Met Val Ala Val Ser Phe Ala
            180                 185                 190

Leu Gly Phe Ala Leu Thr Tyr Met Phe Gly Tyr Glu Asp Glu Val Asp
        195                 200                 205

Ala Thr Ala Ala Ala Lys Arg Ala Glu Val Ala Glu Glu Lys Glu Glu
    210                 215                 220

Val Ala Pro Ala Ala Leu Gln Asn Glu Thr Leu Val Thr Pro Ile Val
225                 230                 235                 240

Gly Asp Val Val Ala Leu Ala Asp Val Asn Asp Pro Val Phe Ser Ser
                245                 250                 255

Gly Ala Met Gly Gln Gly Ile Val Val Lys Pro Ser Gln Gly Val Val
            260                 265                 270

Tyr Ala Pro Ala Asp Ala Glu Val Ser Ile Ala Phe Pro Thr Gly His
        275                 280                 285

Ala Phe Gly Leu Lys Thr Arg Asn Gly Ala Glu Val Leu Ile His Val
    290                 295                 300

Gly Ile Asp Thr Val Ser Met Asn Gly Asp Gly Phe Glu Thr Lys Val
305                 310                 315                 320

Ala Gln Gly Asn Lys Val Lys Ala Gly Asp Val Leu Gly Thr Phe Asp
                325                 330                 335
```

```
Ser Asn Lys Ile Ala Ala Ala Gly Leu Asp Asp Thr Thr Met Val Ile
            340                 345                 350

Val Thr Asn Thr Gly Asp Tyr Ala Ser Val Ala Pro Val Ala Thr Gly
        355                 360                 365

Ser Val Ala Lys Gly Asp Ala Val Ile Glu Val Lys Ile
    370                 375                 380
```

<210> 368
<211> 249
<212> PRT
<213> Streptococcus pneumoniae

<400> 368

```
Met Gln Met Asn Asn Gln Glu Ile Ala Lys Lys Val Ile Asp Ala Leu
1               5                   10                  15

Gly Gly Arg Glu Asn Val Asn Ser Val Ala His Cys Ala Thr Arg Leu
            20                  25                  30

Arg Val Met Val Lys Asp Glu Glu Lys Ile Asn Lys Glu Val Ile Glu
        35                  40                  45

Asn Leu Glu Lys Val Gln Gly Ala Phe Phe Asn Ser Gly Gln Tyr Gln
    50                  55                  60

Ile Ile Phe Gly Thr Gly Thr Val Asn Lys Met Tyr Asp Glu Val Val
65                  70                  75                  80

Val Leu Gly Leu Pro Thr Ser Ser Lys Asp Asp Met Lys Ala Glu Val
                85                  90                  95

Ala Lys Gln Gly Asn Trp Phe Gln Arg Ala Ile Arg Thr Phe Gly Asp
            100                 105                 110

Val Phe Val Pro Ile Ile Pro Val Ile Val Ala Thr Gly Leu Phe Met
        115                 120                 125

Gly Val Arg Gly Leu Phe Asn Ala Leu Glu Met Pro Leu Pro Gly Asp
    130                 135                 140
```

```
Phe Ala Thr Tyr Thr Gln Ile Leu Thr Asp Thr Ala Phe Ile Ile Leu
145                 150                 155                 160

Pro Gly Leu Val Val Trp Ser Thr Phe Arg Val Phe Gly Gly Asn Pro
                165                 170                 175

Ala Val Gly Ile Val Leu Gly Met Met Leu Val Ser Gly Ser Leu Pro
            180                 185                 190

Asn Ala Trp Ala Val Ala Gln Gly Gly Glu Val Thr Ala Met Asn Phe
        195                 200                 205

Phe Gly Phe Ile Pro Val Val Gly Leu Gln Gly Ser Val Leu Pro Ala
    210                 215                 220

Phe Ile Ile Gly Val Val Gly Ala Lys Phe Glu Lys Ala Val Arg Lys
225                 230                 235                 240

Leu Phe Gln Met Ser Leu Thr Ser Trp
                245


<210>  369
<211>  201
<212>  PRT
<213>  Streptococcus pneumoniae

<400>  369

Met Arg Leu Met Lys Ile Trp Tyr Asn Glu Ile Lys Glu Phe Tyr Met
1               5                   10                  15

Gln Lys Phe Ile Gln Ala Tyr Ile Glu Lys Leu Asp Val Thr Thr Ile
            20                  25                  30

Ile Glu Asn Ile Leu Thr Lys Val Ile Ser Leu Leu Leu Leu Leu Ile
        35                  40                  45

Val Phe Tyr Ile Ala Lys Lys Met Leu His Thr Met Val Gln Arg Ile
    50                  55                  60

Val Lys Pro Ser Leu Lys Met Ser Arg His Asp Val Gly Arg Gln Lys
65                  70                  75                  80
```

```
Thr Ile Ser Arg Leu Leu Glu Asn Val Phe Asn Tyr Thr Leu Tyr Phe
                85                  90                  95

Phe Leu Leu Tyr Cys Ile Leu Ser Ile Leu Gly Leu Pro Val Ser Ser
            100                 105                 110

Leu Leu Ala Gly Ala Gly Ile Ala Gly Val Ala Ile Gly Met Gly Ala
        115                 120                 125

Gln Gly Phe Leu Ser Asp Val Ile Asn Gly Phe Phe Ile Leu Phe Glu
    130                 135                 140

Arg Gln Leu Asp Val Gly Asp Glu Val Val Leu Thr Asn Gly Pro Ile
145                 150                 155                 160

Thr Val Ser Gly Lys Val Val Ser Val Gly Ile Arg Thr Thr Gln Leu
                165                 170                 175

Arg Ser Glu Glu Gln Ala Leu His Phe Val Pro Asn Arg Asn Ile Thr
            180                 185                 190

Val Val Ser Asn Phe Ser Arg Thr Asp
        195                 200


<210>  370
<211>  598
<212>  PRT
<213>  Streptococcus pneumoniae

<400>  370

Met Glu Gln Lys His Arg Ser Glu Phe Pro Glu Lys Glu Leu Trp Asp
1               5                   10                  15

Leu Thr Ala Leu Tyr Gln Asp Arg Glu Asp Phe Leu Arg Ala Ile Glu
            20                  25                  30

Lys Ala Arg Glu Asp Ile Asn Gln Phe Ser Arg Asp Tyr Lys Gly Asn
        35                  40                  45

Leu His Thr Phe Glu Asp Phe Glu Lys Ala Phe Ala Glu Leu Glu Gln
    50                  55                  60
```

```
Ile Tyr Ile Gln Met Ser His Ile Gly Asn Tyr Gly Phe Met Pro Gln
65                  70                  75                  80

Thr Thr Asp Tyr Ser Asn Asp Glu Phe Ala Asn Ile Ala Gln Ala Gly
                85                  90                  95

Met Glu Phe Glu Thr Asp Ala Ser Val Ala Leu Thr Phe Phe Asp Asp
            100                 105                 110

Ala Leu Val Ala Ala Asp Glu Glu Val Leu Asp Arg Leu Gly Lys Leu
        115                 120                 125

Pro His Leu Thr Ala Ala Ile Arg Gln Ala Lys Ile Lys Lys Ala His
    130                 135                 140

Tyr Leu Gly Ala Asp Val Glu Lys Ala Leu Thr Asn Leu Gly Glu Val
145                 150                 155                 160

Phe Tyr Ser Pro Gln Asp Ile Tyr Thr Lys Met Arg Ala Gly Asp Phe
                165                 170                 175

Glu Met Ala Asp Phe Glu Ala His Gly Lys Thr Tyr Lys Asn Ser Phe
            180                 185                 190

Val Thr Tyr Glu Asn Phe Tyr Gln Asn His Glu Asp Ala Glu Val Arg
        195                 200                 205

Glu Lys Ser Phe Arg Ser Phe Ser Glu Gly Leu Arg Lys His Gln Asn
    210                 215                 220

Thr Ala Ala Ala Ala Tyr Leu Ala Gln Val Lys Ser Glu Lys Leu Leu
225                 230                 235                 240

Ala Asp Met Lys Gly Tyr Asp Ser Val Phe Asp Tyr Leu Leu Ala Glu
                245                 250                 255

Gln Glu Val Asp Arg Val Met Phe Asp Arg Gln Ile Asp Leu Ile Met
            260                 265                 270

Lys Asp Phe Ala Pro Val Ala Gln Arg Tyr Leu Lys His Val Ala Lys
        275                 280                 285
```

```
Val Asn Gly Leu Glu Lys Met Thr Phe Ala Asp Trp Lys Leu Asp Leu
    290                 295                 300

Asp Ser Ala Leu Asn Pro Glu Val Thr Ile Asp Asp Ala Tyr Asp Leu
305                 310                 315                 320

Val Met Lys Ser Val Glu Pro Leu Gly Gln Glu Tyr Cys Gln Glu Val
                325                 330                 335

Ala Arg Tyr Gln Glu Glu Arg Trp Val Asp Phe Ala Ala Asn Ser Gly
            340                 345                 350

Lys Asp Ser Gly Gly Tyr Ala Ala Asp Pro Tyr Arg Val His Pro Tyr
        355                 360                 365

Val Leu Met Ser Trp Thr Gly Arg Leu Ser Asp Val Tyr Thr Leu Ile
    370                 375                 380

His Glu Ile Gly His Ser Gly Gln Phe Ile Phe Ser Asp Asn His Gln
385                 390                 395                 400

Ser Tyr Phe Asn Ala His Met Ser Thr Tyr Tyr Val Glu Ala Pro Ser
                405                 410                 415

Thr Phe Asn Glu Leu Leu Leu Ser Asp Tyr Leu Glu Asn Gln Ser Asn
            420                 425                 430

Asp Pro Arg Gln Lys Arg Phe Ala Leu Ala His Arg Leu Thr Asp Thr
        435                 440                 445

Tyr Phe His Asn Phe Ile Thr His Leu Leu Glu Ala Ala Phe Gln Arg
    450                 455                 460

Lys Val Tyr Thr Leu Ile Glu Glu Gly Glu Thr Phe Gly Ala Ser Lys
465                 470                 475                 480

Leu Asn Ser Ile Met Lys Glu Val Leu Thr Asp Phe Trp Gly Asp Ala
                485                 490                 495

Ile Glu Ile Asp Asp Asp Ala Thr Leu Thr Trp Met Arg Gln Ala His
```

```
            500                 505                 510

Tyr Tyr Met Gly Leu Tyr Ser Tyr Thr Tyr Ser Ala Gly Leu Val Ile
        515                 520                 525

Ser Thr Ala Gly Tyr Leu His Leu Lys His Ser Glu Thr Gly Ala Glu
    530                 535                 540

Asp Trp Leu Asn Leu Leu Lys Ser Gly Gly Ser Lys Thr Pro Leu Glu
545                 550                 555                 560

Ser Ala Met Ile Ile Gly Ala Asp Ile Ser Thr Asp Lys Pro Leu Arg
                565                 570                 575

Asp Thr Ile Gln Phe Leu Ser Asp Thr Val Asp Gln Ile Ile Ser Tyr
            580                 585                 590

Ser Ala Glu Leu Gly Glu
        595

<210>  371
<211>  190
<212>  PRT
<213>  Streptococcus pneumoniae

<400>  371

Met Tyr Met Ser Lys Ala Lys Lys Ile Cys Phe Ile Ile Phe Cys Ile
1               5                   10                  15

Leu Ile Leu Thr Ile Phe Leu Pro Val Leu Ile Asp Tyr His Gln Val
            20                  25                  30

Ser Asp Leu Gly Ile His Leu Leu Ser Trp Arg Gln Asn Ser Val Val
        35                  40                  45

Glu Phe Tyr Leu Ala Arg Tyr Val Phe Trp Gly Thr Val Val Leu Ser
    50                  55                  60

Thr Leu Val Leu Leu Ser Ile Leu Val Val Met Phe Tyr Pro Lys Arg
65                  70                  75                  80

Tyr Leu Glu Ile Gln Leu Glu Thr Lys Asn Asp Thr Leu Lys Leu Lys
```

```
                85                  90                  95

Asn Ser Ala Ile Glu Gly Phe Val Arg Ser Leu Val Ser Asp His Arg
            100                 105                 110

Leu Ile Lys Asn Pro Thr Val His Val Asn Leu Arg Lys Asn Lys Cys
        115                 120                 125

Phe Val His Val Glu Gly Lys Ile Leu Pro Ser Asp Asn Ile Ala Asp
    130                 135                 140

Arg Cys Gln Ile Ile Gln Asn Glu Ile Thr Asn Gly Leu Lys Gln Phe
145                 150                 155                 160

Phe Gly Ile Glu Arg Gln Val Lys Leu Glu Val Ala Val Lys Asn Tyr
                165                 170                 175

Gln Pro Lys Pro Gln Asn Lys Lys Thr Val Ser Arg Val Lys
            180                 185                 190
```

<210> 372
<211> 219
<212> PRT
<213> Streptococcus pneumoniae

<400> 372

```
Met Ile Asp Phe Tyr Phe Phe Leu Val Gly Ser Ile Leu Ala Ser Phe
1               5                   10                  15

Leu Gly Leu Val Ile Asp Arg Phe Pro Glu Gln Ser Ile Ile Ser Ser
            20                  25                  30

Ala Ser His Cys Asp Ser Cys Gln Thr Pro Leu Arg Pro Leu Asp Leu
        35                  40                  45

Ile Pro Ile Leu Ser Gln Val Phe Asn Arg Phe Arg Cys Arg Tyr Cys
    50                  55                  60

Lys Val Arg Tyr Pro Val Trp Tyr Ala Leu Phe Glu Leu Ser Leu Gly
65                  70                  75                  80

Leu Leu Phe Leu Leu Tyr Ser Trp Gly Trp Leu Ser Leu Gly Gln Val
```

```
                85                  90                  95

Val Leu Ile Thr Ala Gly Leu Thr Leu Gly Ile Tyr Asp Phe His His
            100                 105                 110

Gln Glu Tyr Pro Leu Leu Val Trp Met Thr Phe Gln Leu Ile Leu Ile
        115                 120                 125

Ala Ser Ser Gly Trp Asn Leu Val Met Val Ser Phe Leu Ile Leu Gly
    130                 135                 140

Ile Leu Ala His Phe Ile Asp Ile Arg Met Gly Ala Gly Asp Phe Leu
145                 150                 155                 160

Phe Leu Ala Ser Cys Ala Leu Val Phe Ser Val Thr Glu Leu Leu Ile
                165                 170                 175

Leu Ile Gln Phe Ala Ser Ala Thr Gly Ile Leu Ala Phe Leu Leu Gln
            180                 185                 190

Lys Lys Lys Glu Arg Leu Pro Phe Val Pro Phe Leu Leu Leu Ala Thr
        195                 200                 205

Cys Leu Ile Ile Phe Gly Lys Leu Leu Leu Val
    210                 215

<210>  373
<211>  383
<212>  PRT
<213>  Streptococcus pneumoniae

<400>  373

Met Phe Asn Gly Arg Val Leu Lys Glu Leu Arg Leu Leu Asn Gly Leu
1               5                   10                  15

Ser Arg Ala Glu Leu Ala Gln Arg Ile Asn Leu Thr Glu Gln Ala Ile
            20                  25                  30

Trp Gln Phe Glu Ser Asn Glu Thr Lys Pro Lys Leu Ser Thr Lys Met
        35                  40                  45

His Leu Ala Asn Gln Phe His Val Asp Leu Thr Tyr Phe Glu Gln Glu
```

```
    50                  55                  60

Glu Glu Ser Ile Arg Phe Asp Ser Ser Val Ile Ala Phe Arg Asn Ala
65                  70                  75                  80

Asp Leu Ala Thr Arg Lys Thr Ile Asp Ile Gln Thr Met Tyr Leu His
                85                  90                  95

Lys Val Asp Ser Leu Ile Asp Tyr Phe Glu Ser Phe Val Ile Ile Pro
            100                 105                 110

Asn Ile Ile Ile His Asp Leu Ser Asn Val Val Ser Glu Ser Tyr His
        115                 120                 125

Lys Gly Glu Ser Ile Glu Glu Leu Ala Leu Tyr Ala Arg Glu Lys Leu
    130                 135                 140

Gly Ile Ser Lys Asp Asn His Asp Leu Leu Tyr Lys Leu Glu Arg Ser
145                 150                 155                 160

Gly Ile Tyr Ile Val Glu Arg Leu Ile Asn Gly Gln Ala Asp Ala Tyr
                165                 170                 175

Ser Ala Trp Ser Lys Leu Gly Arg Pro Tyr Ile Val Leu Gly Thr Asn
            180                 185                 190

Lys Ser Ser Val Arg Arg Asn Phe Asp Leu Ala His Glu Leu Gly His
        195                 200                 205

Ile Leu Leu His Lys Tyr Lys Asp Met Asn Glu Asp Gly Asp Arg Leu
    210                 215                 220

Glu Gln Glu Ala Asn Tyr Phe Ala Ser Cys Phe Leu Leu Pro Lys Glu
225                 230                 235                 240

Glu Phe Leu Val Lys Phe Glu Glu Arg Val Gly Lys Arg Val Ser Asn
                245                 250                 255

Pro Asp Ser Tyr Ile Leu Leu Lys Ser Asp Leu Asn Val Ser Ile Gln
            260                 265                 270
```

```
Ala Leu Glu Tyr Arg Ala Phe Lys Leu Gly Leu Leu Thr Pro Lys Gln
        275                 280                 285

His Ser Tyr Phe Tyr Arg Gln Ile Ala Gln Lys Gly Tyr Lys Met Ile
    290                 295                 300

Glu Pro Leu Asp Asp Gln Ile Phe Val Lys Lys Pro Ser Lys Val Lys
305                 310                 315                 320

Ser Ile Leu Asp Val Val Leu Ser Asn His Leu Val Ser Leu Ala Thr
                325                 330                 335

Ile Met Ser Lys Gln Ser Ile Arg Leu Gln Phe Ile Ser Glu Ile Phe
            340                 345                 350

Ser Val Glu Met Lys Phe Phe Asp Gln Tyr Gln Glu Asp Arg Arg Thr
        355                 360                 365

Asp Arg Phe Asp Asn Ile Ile Pro Leu Tyr Lys Arg Asn Asn Leu
    370                 375                 380

<210>  374
<211>  594
<212>  PRT
<213>  Streptococcus pneumoniae

<400>  374

Met Ala Ser Gly Phe His Leu Gln Ser Glu Arg Asp Phe Met Ser Ile
1               5                   10                  15

Ile Gln Lys Leu Trp Trp Phe Phe Lys Leu Glu Lys Arg Arg Tyr Leu
            20                  25                  30

Val Gly Ile Val Ala Leu Ile Leu Val Ser Val Leu Asn Leu Ile Pro
        35                  40                  45

Pro Met Val Met Gly Arg Val Ile Asp Ala Ile Thr Ser Gly Gln Leu
    50                  55                  60

Thr Gln Gln Asp Leu Leu Leu Ser Leu Phe Tyr Leu Leu Leu Ala Ala
65                  70                  75                  80
```

```
Phe Gly Met Tyr Tyr Leu Arg Tyr Val Trp Arg Met Tyr Ile Leu Gly
                85                  90                  95

Thr Ser Tyr Cys Leu Gly Gln Ile Met Arg Ser Arg Leu Phe Lys His
            100                 105                 110

Phe Thr Lys Met Ser Ser Ala Phe Tyr Gln Thr Tyr Arg Thr Gly Asp
        115                 120                 125

Leu Met Ala His Ala Thr Asn Asp Ile Asn Ala Leu Thr Arg Leu Ala
    130                 135                 140

Gly Gly Gly Val Met Ser Ala Val Asp Ala Ser Ile Thr Ala Leu Val
145                 150                 155                 160

Thr Leu Leu Thr Met Leu Phe Ser Ile Ser Trp Gln Met Thr Leu Val
                165                 170                 175

Ala Ile Leu Pro Leu Pro Phe Met Ala Tyr Thr Thr Ser Arg Leu Gly
            180                 185                 190

Arg Lys Thr His Lys Ala Phe Gly Glu Ser Gln Ala Ala Phe Ser Glu
        195                 200                 205

Leu Asn Asn Lys Val Gln Glu Ser Val Ser Gly Ile Lys Val Thr Lys
    210                 215                 220

Ser Phe Gly Tyr Gln Ala Asp Glu Leu Lys Ser Phe Gln Ala Val Asn
225                 230                 235                 240

Glu Leu Thr Phe Gln Lys Asn Leu Gln Thr Met Lys Tyr Asp Ser Leu
                245                 250                 255

Phe Asp Pro Met Val Leu Leu Phe Val Gly Ser Ser Tyr Val Leu Thr
            260                 265                 270

Leu Leu Val Gly Ser Leu Met Val Gln Glu Gly Gln Ile Thr Val Gly
        275                 280                 285

Asn Leu Val Thr Phe Ile Ser Tyr Leu Asp Met Leu Val Trp Pro Leu
    290                 295                 300
```

```
Leu Ala Ile Gly Phe Leu Phe Asn Thr Thr Gln Arg Gly Lys Val Ser
305                 310                 315                 320

Tyr Gln Arg Ile Glu Asn Leu Leu Ser Gln Glu Ser Pro Val Gln Asp
                325                 330                 335

Pro Glu Phe Pro Leu Asp Gly Ile Glu Asn Gly Arg Leu Glu Tyr Ala
            340                 345                 350

Ile Asp Ser Phe Ala Phe Glu Asn Glu Glu Thr Leu Thr Asp Ile His
        355                 360                 365

Phe Ser Leu Ala Lys Gly Gln Thr Leu Gly Leu Val Gly Gln Thr Gly
    370                 375                 380

Ser Gly Lys Thr Ser Leu Ile Lys Leu Leu Leu Arg Glu Tyr Asp Val
385                 390                 395                 400

Asp Lys Gly Ala Ile Tyr Leu Asn Gly His Asp Ile Arg Asp Tyr Arg
                405                 410                 415

Leu Thr Asp Leu Arg Ser Leu Met Gly Tyr Val Pro Gln Asp Gln Phe
            420                 425                 430

Leu Phe Ala Thr Ser Ile Leu Asp Asn Ile Arg Phe Gly Asn Pro Asn
        435                 440                 445

Leu Pro Leu Ser Ala Val Glu Glu Ala Thr Lys Leu Ala Arg Val Tyr
    450                 455                 460

Gln Asp Ile Val Asp Met Pro Gln Gly Phe Asp Thr Leu Ile Gly Glu
465                 470                 475                 480

Lys Gly Val Ser Leu Ser Gly Gly Gln Lys Gln Arg Leu Ala Met Ser
                485                 490                 495

Arg Ala Met Ile Leu Asp Pro Asp Ile Leu Ile Leu Asp Asp Ser Leu
            500                 505                 510

Ser Ala Val Asp Ala Lys Thr Glu Tyr Ala Ile Ile Asp Asn Leu Lys
        515                 520                 525
```

```
Glu Met Arg Lys Asp Lys Thr Thr Ile Ile Thr Ala His Arg Leu Ser
    530                 535                 540

Ala Val Val His Ala Asp Phe Ile Leu Val Leu Gln Asn Gly Gln Ile
545                 550                 555                 560

Ile Glu Arg Gly Thr His Glu Asp Leu Leu Ala Leu Asp Gly Trp Tyr
                565                 570                 575

Ala Gln Thr Tyr Gln Ser Gln Gln Leu Glu Met Lys Gly Glu Glu Asp
            580                 585                 590

Ala Glu
```

<210> 375
<211> 655
<212> PRT
<213> Streptococcus pneumoniae

<400> 375

```
Met Gly Lys Phe Glu Gln Glu Ala Lys Asp Leu Leu Gln Ala Ile Gly
1               5                   10                  15

Gly Lys Glu Asn Val Thr Ala Val Thr His Cys Ala Thr Arg Met Arg
            20                  25                  30

Phe Val Leu Gly Asp Asp Lys Lys Ala Asn Val Lys Ala Ile Glu Ser
        35                  40                  45

Ile Pro Ala Val Lys Gly Thr Phe Thr Asn Ala Gly Gln Phe Gln Val
    50                  55                  60

Ile Ile Gly Asn Asp Val Pro Ile Phe Tyr Asn Asp Phe Thr Ala Val
65                  70                  75                  80

Ser Gly Ile Glu Gly Val Ser Lys Glu Ala Ala Lys Ser Ala Ala Lys
                85                  90                  95

Ser Asn Gln Asn Val Val Gln Gly Val Met Thr Thr Leu Ala Glu Ile
            100                 105                 110
```

```
Phe Thr Pro Ile Ile Pro Ala Leu Ile Val Gly Gly Leu Ile Leu Gly
        115                 120                 125

Phe Arg Asn Val Leu Glu Gly Val His Trp Ser Met Leu Asp Gly Lys
    130                 135                 140

Thr Ile Thr Glu Ser Ser Gln Phe Trp Ala Gly Val Asn His Phe Leu
145                 150                 155                 160

Trp Leu Pro Gly Glu Ala Ile Phe Gln Phe Leu Pro Val Gly Ile Thr
                165                 170                 175

Trp Ser Val Ser Arg Lys Met Gly Thr Ser Gln Ile Leu Gly Ile Val
            180                 185                 190

Leu Gly Ile Cys Leu Val Ser Pro Gln Leu Leu Asn Ala Tyr Ala Val
        195                 200                 205

Ala Ser Thr Pro Ala Ala Asp Ile Ala Ala Asn Trp Val Trp Asn Phe
    210                 215                 220

Gly Tyr Phe Thr Val Asn Arg Ile Gly Tyr Gln Ala Gln Val Ile Pro
225                 230                 235                 240

Ala Leu Leu Ala Gly Leu Ser Leu Ser Tyr Leu Glu Ile Phe Trp His
                245                 250                 255

Lys His Ile Pro Glu Val Ile Ser Met Ile Phe Val Pro Phe Leu Ser
            260                 265                 270

Leu Ile Pro Ala Leu Ile Leu Ala His Thr Val Leu Gly Pro Ile Gly
        275                 280                 285

Trp Thr Ile Gly Gln Gly Leu Ser Ser Val Val Leu Ala Gly Leu Thr
    290                 295                 300

Gly Pro Val Lys Trp Leu Phe Gly Ala Ile Phe Gly Ala Leu Tyr Ala
305                 310                 315                 320

Pro Phe Val Ile Thr Gly Leu His His Met Thr Asn Ala Ile Asp Thr
```

```
                325                 330                 335

Gln Leu Ile Ala Asp Ala Gly Gly Thr Ala Leu Trp Pro Met Ile Ala
            340                 345                 350

Leu Ser Asn Ile Ala Gln Gly Ser Ala Val Phe Ala Tyr Tyr Phe Met
        355                 360                 365

His Arg His Asp Glu Arg Glu Ala Gln Val Ser Leu Pro Ala Thr Ile
    370                 375                 380

Ser Ala Tyr Leu Gly Val Thr Glu Pro Ala Leu Phe Gly Val Asn Val
385                 390                 395                 400

Lys Tyr Ile Tyr Pro Phe Val Ala Gly Met Thr Gly Ser Ala Leu Ala
                405                 410                 415

Gly Met Leu Ser Val Thr Phe Asn Val Thr Ala Ala Ser Ile Gly Ile
            420                 425                 430

Gly Gly Leu Pro Gly Ile Leu Ser Ile Gln Pro Gln Tyr Met Leu Pro
        435                 440                 445

Phe Ala Gly Thr Met Leu Val Ala Ile Val Val Pro Met Leu Leu Thr
    450                 455                 460

Phe Phe Phe Arg Lys Ala Gly Leu Phe Thr Lys Thr Glu Gly Asp Thr
465                 470                 475                 480

Asn Leu Gln Ala Glu Phe Val Ala Gln Glu Glu Ala Glu Phe Val Asn
                485                 490                 495

His Glu Pro Val Glu Leu Thr Ser Val Glu Ile Ile Ser Pro Leu Thr
            500                 505                 510

Gly Gln Val Lys Glu Leu Ser Gln Ala Thr Asp Pro Ile Phe Ala Ser
        515                 520                 525

Gly Val Met Gly Gln Gly Leu Val Ile Glu Pro Ser Gln Gly Glu Leu
    530                 535                 540
```

```
Thr Ser Pro Val Asn Gly Thr Val Thr Val Leu Phe Pro Thr Lys His
545                 550                 555                 560

Ala Ile Gly Ile Val Ser Asp Glu Gly Val Glu Leu Leu Ile His Ile
                565                 570                 575

Gly Met Asp Thr Val Gly Leu Asp Gly Lys Gly Phe Glu Ser Leu Val
            580                 585                 590

Val Gln Gly Asp His Val Thr Val Gly Gln Gln Leu Ile Arg Phe Asp
        595                 600                 605

Met Asp Val Ile Lys Ala Ala Gly Leu Val Thr Glu Thr Pro Val Ile
    610                 615                 620

Ile Thr Asn Gln Asp Ala Tyr Thr Ala Thr Ile Pro Gly Thr Tyr Pro
625                 630                 635                 640

Thr Thr Ile Gln Ala Gly Ala Ser Leu Met Val Ala Thr Arg Ile
                645                 650                 655
```

<210> 376
<211> 175
<212> PRT
<213> Streptococcus pneumoniae

<400> 376

```
Met Ser Arg Val His Val Gln Ile Met Asn Gln Phe His Arg Lys Ser
1               5                   10                  15

His Glu Tyr Lys Ala Ile Lys Arg Tyr Trp Lys Leu Ile Gln Gln Asp
            20                  25                  30

Ser Arg Lys Leu Ser Asp Lys Arg Phe Tyr Arg Pro Thr Phe Arg Met
        35                  40                  45

His Leu Thr Asn Lys Glu Ile Leu Asp Lys Ile Leu Ser Tyr Ser Glu
    50                  55                  60

Asp Leu Lys His His Tyr Gln Ile Tyr Gln Leu Leu Leu Phe His Phe
65                  70                  75                  80
```

```
Gln Asn Lys Asp Pro Glu Lys Phe Phe Gly Leu Ile Glu Asp Asn Leu
                85                  90                  95

Lys Gln Val His Pro Leu Phe Gln Thr Val Phe Lys Thr Phe Leu Lys
            100                 105                 110

Asp Lys Glu Lys Ile Ile Asn Ala Leu Gln Leu His Tyr Ser Asn Ala
        115                 120                 125

Lys Leu Glu Ala Thr Asn Asn Leu Ile Lys Leu Ile Lys Arg Asn Ala
    130                 135                 140

Phe Gly Phe Arg Asn Phe Glu Asn Phe Lys Lys Arg Ile Phe Ile Ala
145                 150                 155                 160

Leu Asn Ile Lys Lys Glu Arg Thr Lys Phe Val Leu Ser Arg Ala
                165                 170                 175

<210>  377
<211>  355
<212>  PRT
<213>  Streptococcus pneumoniae

<400>  377

Met Thr Lys Glu Lys Asn Val Ile Leu Thr Ala Arg Asp Ile Val Val
1               5                   10                  15

Glu Phe Asp Val Arg Asp Lys Val Leu Thr Ala Ile Arg Gly Val Ser
            20                  25                  30

Leu Glu Leu Val Glu Gly Glu Val Leu Ala Leu Val Gly Glu Ser Gly
        35                  40                  45

Ser Gly Lys Ser Val Leu Thr Lys Thr Phe Thr Gly Met Leu Glu Glu
    50                  55                  60

Asn Gly Arg Ile Ala Gln Gly Ser Ile Asp Tyr Arg Gly Gln Asp Leu
65                  70                  75                  80

Thr Ala Leu Ser Ser His Lys Asp Trp Glu Gln Ile Arg Gly Ala Lys
                85                  90                  95
```

```
Ile Ala Thr Ile Phe Gln Asp Pro Met Thr Ser Leu Asp Pro Ile Lys
            100                 105                 110

Thr Ile Gly Ser Gln Ile Thr Glu Val Ile Val Lys His Gln Gly Lys
        115                 120                 125

Thr Ala Lys Glu Ala Lys Glu Leu Ala Ile Asp Tyr Met Asn Lys Val
    130                 135                 140

Gly Ile Pro Asp Ala Asp Arg Arg Phe Asn Glu Tyr Pro Phe Gln Tyr
145                 150                 155                 160

Ser Gly Gly Met Arg Gln Arg Ile Val Ile Ala Ile Ala Leu Ala Cys
                165                 170                 175

Arg Pro Asp Val Leu Ile Cys Asp Glu Pro Thr Thr Ala Leu Asp Val
            180                 185                 190

Thr Ile Gln Ala Gln Ile Ile Asp Leu Leu Lys Ser Leu Gln Asn Glu
        195                 200                 205

Tyr His Phe Thr Thr Ile Phe Ile Thr His Asp Leu Gly Val Val Ala
    210                 215                 220

Ser Ile Ala Asp Lys Val Ala Val Met Tyr Ala Gly Glu Ile Val Glu
225                 230                 235                 240

Tyr Gly Thr Val Glu Glu Val Phe Tyr Asp Pro Arg His Pro Tyr Thr
                245                 250                 255

Trp Ser Leu Leu Ser Ser Leu Pro Gln Leu Ala Asp Asp Lys Gly Asp
            260                 265                 270

Leu Tyr Ser Ile Pro Gly Thr Pro Pro Ser Leu Tyr Thr Asp Leu Lys
        275                 280                 285

Gly Asp Ala Phe Ala Leu Arg Ser Asp Tyr Ala Met Gln Ile Asp Phe
    290                 295                 300

Glu Gln Lys Ala Pro Gln Phe Ser Val Ser Glu Thr His Trp Ala Lys
305                 310                 315                 320
```

```
Thr Trp Leu Leu His Glu Asp Ala Pro Lys Val Glu Lys Pro Ala Val
                325                 330                 335

Ile Ala Asn Leu His Asp Lys Ile Arg Glu Lys Met Gly Phe Ala His
            340                 345                 350

Leu Ala Asp
        355

<210>  378
<211>  308
<212>  PRT
<213>  Streptococcus pneumoniae

<400>  378

Met Ser Thr Ile Asp Lys Glu Lys Phe Gln Phe Val Lys Arg Asp Asp
1               5                   10                  15

Phe Ala Ser Glu Thr Ile Asp Ala Pro Ala Tyr Ser Tyr Trp Lys Ser
            20                  25                  30

Val Phe Lys Gln Phe Met Lys Lys Lys Ser Thr Val Val Met Leu Gly
        35                  40                  45

Ile Leu Val Ala Ile Ile Leu Ile Ser Phe Ile Tyr Pro Met Phe Ser
    50                  55                  60

Lys Phe Asp Phe Asn Asp Val Ser Lys Val Asn Asp Phe Ser Val Arg
65                  70                  75                  80

Tyr Ile Lys Pro Asn Ala Glu His Trp Phe Gly Thr Asp Ser Asn Gly
                85                  90                  95

Lys Ser Leu Phe Asp Gly Val Trp Phe Gly Ala Arg Asn Ser Ile Leu
            100                 105                 110

Ile Ser Val Ile Ala Thr Val Ile Asn Leu Val Ile Gly Val Phe Val
        115                 120                 125

Gly Gly Ile Trp Gly Ile Ser Lys Ser Val Asp Arg Val Met Met Glu
    130                 135                 140
```

```
Val Tyr Asn Val Ile Ser Asn Ile Pro Pro Leu Leu Ile Val Ile Val
145                 150                 155                 160

Leu Thr Tyr Ser Ile Gly Ala Gly Phe Trp Asn Leu Ile Phe Ala Met
                165                 170                 175

Ser Val Thr Thr Trp Ile Gly Ile Ala Phe Met Ile Arg Val Gln Ile
            180                 185                 190

Leu Arg Tyr Arg Asp Leu Glu Tyr Asn Leu Ala Ser Arg Thr Leu Gly
        195                 200                 205

Thr Pro Thr Leu Lys Ile Val Ala Lys Asn Ile Met Pro Gln Leu Val
    210                 215                 220

Ser Val Ile Val Thr Thr Met Thr Gln Met Leu Pro Ser Phe Ile Ser
225                 230                 235                 240

Tyr Glu Ala Phe Leu Ser Phe Phe Gly Leu Gly Leu Pro Ile Thr Val
                245                 250                 255

Pro Ser Leu Gly Arg Leu Ile Ser Asp Tyr Ser Gln Asn Val Thr Thr
            260                 265                 270

Asn Ala Tyr Leu Phe Trp Ile Pro Leu Thr Thr Leu Val Leu Val Ser
        275                 280                 285

Leu Ser Leu Phe Val Val Gly Gln Asn Leu Ala Asp Ala Ser Asp Pro
    290                 295                 300

Arg Thr His Arg
305
```

<210> 379
<211> 498
<212> PRT
<213> Streptococcus pneumoniae

<400> 379

```
Met Lys Lys Tyr Ile Phe Met Arg Val Leu Arg Ser Leu Val Ser Ile
1               5                   10                  15
```

```
Phe Leu Val Thr Thr Leu Thr Tyr Thr Ile Ile Tyr Thr Leu Val Pro
            20                  25                  30

Arg Lys Leu Ile Phe Lys Gln Asp Pro Asn Tyr Asn Lys Ile Ala Thr
        35                  40                  45

Thr Ala Asp Lys Arg Asp Asn Tyr Glu Asn Thr Val Phe Glu Arg Met
    50                  55                  60

Gly Tyr Ile Glu Tyr Tyr Asp Thr Lys Glu Leu Gln Glu Lys Ala Ser
65                  70                  75                  80

Ser Met Asp Ser Ser Val Thr Val Glu Ala Asn Ala Thr Asn Lys Ala
                85                  90                  95

Ile Tyr Glu Lys Tyr Ile Asn Gln Leu Gly His Gly Trp Thr Leu Gly
            100                 105                 110

Glu Phe Thr Glu Ser Gly Gln Phe Tyr Ala Thr Arg Glu Ile Pro Ile
        115                 120                 125

Phe Glu Arg Val Phe His Phe Tyr Ala Asn Leu Ile Asp Ile Asp His
    130                 135                 140

Thr Asn Lys Ile Gln Asp Pro Glu Asn Pro Asp Leu Lys Arg Tyr Leu
145                 150                 155                 160

Arg Phe Glu Asn Asp Pro Ala Ile Gly Trp Ser Leu Val Gly Ser Gly
                165                 170                 175

Thr Lys His Lys Tyr Leu Leu Tyr Phe Asn Ser Gln Phe Pro Phe Val
            180                 185                 190

His Gln Asn Phe Val Asn Leu Asn Leu Gly Asp Ser Tyr Pro Thr Tyr
        195                 200                 205

Ala Asn Thr Pro Val Leu Gln Val Ile Thr Gln Gly Gln Gly Gln Thr
    210                 215                 220

Lys Thr Ala Gln Val Gln Phe Pro Thr Gly Lys Lys Thr Ser Ser Val
225                 230                 235                 240
```

```
Asn Ile Tyr Ser Arg Thr Tyr Lys Ser Pro Ser Gln Ala Asp Ser Arg
                245                 250                 255

Glu Val Ala Ser Tyr Gly Lys Asp Asp Pro Tyr Thr Ala Thr Glu Ser
            260                 265                 270

Asn Tyr Gln Tyr Pro Ser Met Ile Val Ser Ser Ala Ile Thr Gly Leu
        275                 280                 285

Ile Gly Leu Val Leu Ala Tyr Ala Leu Ala Val Pro Leu Gly Ser Ala
    290                 295                 300

Met Ala Arg Phe Lys Asn Thr Trp Ile Asp Ser Leu Ser Thr Gly Ala
305                 310                 315                 320

Leu Thr Phe Leu Leu Ala Leu Pro Thr Ile Ala Leu Val Tyr Ile Val
                325                 330                 335

Arg Leu Ile Gly Ser Ser Ile Ala Leu Pro Asp Ser Phe Pro Ile Leu
            340                 345                 350

Gly Ala Gly Asp Trp Arg Ser Tyr Val Leu Pro Ala Val Ile Leu Gly
        355                 360                 365

Leu Leu Gly Ala Pro Gly Thr Ala Ile Trp Ile Arg Arg Tyr Met Ile
    370                 375                 380

Asp Leu Gln Ser Gln Asp Phe Val Arg Phe Ala Arg Ala Lys Gly Leu
385                 390                 395                 400

Ser Glu Lys Glu Ile Ser Asn Lys His Ile Phe Lys Asn Ala Met Val
                405                 410                 415

Pro Leu Val Ser Gly Ile Pro Ala Ala Ile Ile Gly Val Ile Gly Gly
            420                 425                 430

Ala Thr Leu Thr Glu Thr Val Phe Ala Phe Pro Gly Met Gly Lys Met
        435                 440                 445

Leu Ile Asp Ser Val Lys Ala Ser Asn Asn Ser Met Val Val Gly Leu
```

```
    450                 455                 460

Val Phe Ile Phe Thr Cys Ile Ser Ile Phe Ser Arg Leu Leu Gly Asp
465                 470                 475                 480

Ile Trp Met Thr Ile Ile Asp Pro Arg Ile Lys Leu Thr Glu Lys Gly
                485                 490                 495

Gly Lys


<210>  380
<211>  343
<212>  PRT
<213>  Streptococcus pneumoniae

<400>  380

Met Gly Phe Leu Leu Met Gly Ala Leu Phe Ile Val Leu Pro Arg Thr
1               5                   10                  15

Met Val Ser Ala Lys Arg Ile Asn Gln Val Leu Asp Leu His Ser Ser
            20                  25                  30

Ile Gln Asn Pro Val Gln Val Gln Leu Thr Asp Glu Asn Phe Lys Gly
        35                  40                  45

Gln Val Glu Phe Lys Asp Val Thr Phe Arg Tyr Ala Ala Asn Ser Glu
    50                  55                  60

Ala Val Ile Glu His Val Ser Phe Lys Ala Glu Thr Gly Gln Thr Val
65                  70                  75                  80

Ala Phe Ile Gly Ser Thr Gly Ser Gly Lys Ser Thr Leu Val Asn Leu
                85                  90                  95

Ile Pro Arg Phe Tyr Asp Val Ser Ala Gly Glu Ile Leu Val Asp Gly
            100                 105                 110

Val Asn Val Gln Asp Tyr Asp Phe Ser Ala Thr Ala His Ala Gly Gln
        115                 120                 125

Lys Val Ala Ile Val Gly Pro Thr Gly Ala Gly Lys Thr Thr Ile Val
```

```
    130                 135                 140

Asn Leu Leu Met Lys Phe Tyr Glu Ile Asp Lys Gly Ser Ile Arg Ile
145                 150                 155                 160

Asp Gly Val Asp Thr Lys Ala Met Thr Arg Ser Glu Val His Asp Ala
                165                 170                 175

Phe Ser Met Val Leu Gln Asp Thr Trp Leu Phe Glu Gly Thr Ile Arg
            180                 185                 190

Asp Asn Leu Ile Tyr Asn Gln Ile Gly Ile Ser Asp Glu Arg Met Met
        195                 200                 205

Glu Ala Ser Lys Ala Val Gly Ile His His Phe Ile Met Thr Leu Pro
    210                 215                 220

Asp Gly Tyr Asp Thr Ile Leu Asp Asp Thr Val Thr Leu Ser Val Arg
225                 230                 235                 240

Gln Lys Gln Leu Leu Thr Ile Ala Arg Ala Leu Leu Lys Asp Ala Pro
                245                 250                 255

Leu Leu Ile Leu Asp Glu Ala Thr Ser Ser Val Asp Thr Arg Thr Glu
            260                 265                 270

Glu Leu Ile Gln Lys Ala Met Asp Arg Leu Met Glu Gly Arg Thr Ser
        275                 280                 285

Phe Val Ile Ala His Arg Leu Ser Thr Ile Arg Asn Ala Asp Leu Ile
    290                 295                 300

Leu Val Met Lys Asp Gly Asn Ile Ile Glu Gln Gly Asn Tyr Glu Glu
305                 310                 315                 320

Leu Met Ala Gln Gly Gly Phe Tyr Ala Asp Leu Tyr Asn Ser Gln Phe
                325                 330                 335

Thr Glu Asp Glu Ala Glu Glu
            340
```

<210> 381
<211> 273
<212> PRT
<213> Streptococcus pneumoniae

<400> 381

```
Met Ile Leu Leu Ala Ile Leu Phe Thr Cys Phe Ser Val Tyr Leu Glu
1               5                  10                  15

Leu Glu Val Pro Thr Tyr Ile Ser Lys Ile Thr Asp Leu Leu Gly Ser
            20                  25                  30

Gln Glu Thr Asn Leu Asp Glu Leu Trp Gln Ser Ala Ser Met Met Met
        35                  40                  45

Gly Met Ser Phe Leu Ala Phe Leu Ser Val Val Ala Val Gly Phe Phe
    50                  55                  60

Ala Ser Arg Val Ala Ala Ser Tyr Thr Ser Arg Leu Arg Ser Asp Ile
65                  70                  75                  80

Phe Asn Arg Val Leu Asp Tyr Ser Gln Thr Glu Ile Lys Lys Phe Ser
                85                  90                  95

Ile Pro Ser Leu Leu Thr Arg Thr Thr Asn Asp Ile Thr Gln Val Gln
            100                 105                 110

Met Leu Ile Thr Met Gly Leu Gln Val Val Thr Arg Gly Ser Ile Met
        115                 120                 125

Ala Ile Trp Ala Ile Gly Lys Ile Leu Gly His Ser Glu Tyr Trp Leu
    130                 135                 140

Trp Ala Val Leu Val Ala Val Ile Ile Asn Val Leu Met Thr Thr Val
145                 150                 155                 160

Leu Met Thr Leu Ala Phe Pro Lys Gln Ser Leu Ile Gln Gly Leu Thr
                165                 170                 175

Asp Lys Leu Asn Ser Ile Thr Arg Glu Ser Leu Thr Gly Ile Arg Val
            180                 185                 190
```

```
Val Arg Ala Tyr Asn Ala Glu Asp Tyr Gln Asn Glu Lys Phe Ala Ala
        195                 200                 205

Val Asn Asp Glu Leu Thr Arg Leu Asn Leu Phe Val Asn Arg Leu Met
    210                 215                 220

Ala Ile Leu Asn Pro Ile Met Met Gly Ile Ser Ser Gly Leu Ser Val
225                 230                 235                 240

Ala Ile Tyr Trp Ile Gly Ala Tyr Val Ile Asn Asp Ala Ala Pro Ile
                245                 250                 255

Ala Arg Leu Pro Leu Phe Ser Asp Met Ile Val Phe Met Ser Tyr Ala
            260                 265                 270

Met
```

<210> 382
<211> 456
<212> PRT
<213> Streptococcus pneumoniae

<400> 382

```
Met Asn Lys Lys Arg Thr Val Asp Leu Ile His Gly Pro Ile Leu Pro
1               5                   10                  15

Ser Leu Leu Ser Phe Thr Phe Pro Ile Leu Leu Ser Asn Ile Phe Gln
            20                  25                  30

Gln Leu Tyr Asn Thr Ala Asp Val Leu Ile Val Gly Arg Phe Leu Gly
        35                  40                  45

Gln Glu Ser Leu Ala Ala Val Gly Ala Thr Thr Ala Ile Phe Asp Leu
    50                  55                  60

Ile Val Gly Phe Thr Leu Gly Val Gly Asn Gly Met Gly Ile Val Ile
65                  70                  75                  80

Ala Arg Tyr Tyr Gly Ala Arg Asn Phe Thr Lys Ile Lys Glu Ala Val
                85                  90                  95
```

```
Ala Ala Thr Trp Ile Leu Gly Ala Leu Leu Ser Ile Leu Val Met Leu
            100                 105                 110

Leu Gly Phe Leu Gly Leu Tyr Pro Leu Leu Gln Tyr Leu Asp Thr Pro
        115                 120                 125

Ala Glu Ile Leu Pro Gln Ser Tyr Gln Tyr Ile Ser Met Ile Val Thr
    130                 135                 140

Cys Val Gly Val Ser Phe Ala Tyr Asn Leu Phe Ala Gly Leu Leu Arg
145                 150                 155                 160

Ser Ile Gly Asp Ser Leu Ala Ala Leu Gly Phe Leu Ile Phe Ser Ala
                165                 170                 175

Leu Val Asn Val Val Leu Asp Leu Tyr Phe Ile Thr Gln Leu His Leu
            180                 185                 190

Gly Val Gln Ser Ala Gly Leu Ala Thr Ile Ile Ser Gln Gly Leu Ser
        195                 200                 205

Ala Val Leu Cys Phe Tyr Tyr Ile Arg Lys Ser Val Pro Glu Leu Leu
    210                 215                 220

Pro Gln Phe Lys His Phe Lys Trp Asp Lys Ser Leu Tyr Ala Asp Leu
225                 230                 235                 240

Leu Glu Gln Gly Leu Ala Met Gly Leu Met Ser Ser Ile Val Ser Ile
                245                 250                 255

Gly Ser Val Ile Leu Gln Phe Ser Val Asn Thr Phe Gly Ala Val Ile
            260                 265                 270

Ile Ser Ala Gln Thr Ala Ala Arg Arg Ile Met Thr Phe Ala Leu Leu
        275                 280                 285

Pro Met Thr Ala Ile Ser Ala Ser Met Thr Thr Phe Ala Ser Gln Asn
    290                 295                 300

Leu Gly Ala Lys Arg Pro Asp Arg Ile Val Gln Gly Leu Arg Ile Gly
305                 310                 315                 320
```

```
Ser Arg Leu Ser Ile Ser Trp Ala Val Phe Val Cys Ile Phe Leu Phe
                325                 330                 335

Phe Ala Ser Pro Ala Leu Val Ser Phe Leu Ala Ser Ser Thr Asp Gly
            340                 345                 350

Tyr Leu Ile Glu Asn Gly Ser Leu Tyr Leu Gln Ile Ser Ser Thr Phe
        355                 360                 365

Tyr Pro Ile Leu Ser Leu Leu Leu Ile Tyr Arg Asn Cys Leu Gln Gly
    370                 375                 380

Leu Gly Gln Lys Ile Leu Pro Leu Val Ser Ser Phe Ile Glu Leu Ile
385                 390                 395                 400

Gly Lys Ile Val Phe Val Val Leu Ile Ile Pro Trp Ala Gly Tyr Lys
                405                 410                 415

Gly Val Ile Leu Cys Glu Pro Leu Ile Trp Val Ala Met Thr Val Gln
            420                 425                 430

Leu Tyr Phe Ser Leu Phe Arg His Pro Leu Ile Lys Glu Gly Lys Ala
        435                 440                 445

Ile Leu Ala Thr Lys Val Gln Ser
    450                 455


<210>  383
<211>  206
<212>  PRT
<213>  Streptococcus pneumoniae

<400>  383

Met Lys Ser Met Arg Ile Leu Phe Leu Leu Ala Leu Ile Gln Ile Ser
1               5                   10                  15

Leu Ser Ser Cys Phe Leu Trp Lys Glu Cys Ile Leu Ser Phe Lys Gln
            20                  25                  30

Ser Thr Ala Phe Phe Ile Gly Ser Met Val Phe Val Ser Gly Ile Cys
        35                  40                  45
```

```
Ala Gly Val Asn Tyr Leu Tyr Thr Arg Lys Gln Glu Val His Ser Val
    50                  55                  60

Leu Ala Ser Lys Lys Ser Val Lys Leu Phe Tyr Ser Met Leu Leu Leu
65                  70                  75                  80

Ile Asn Leu Leu Gly Ala Val Leu Val Leu Ser Asp Asn Leu Phe Ile
                85                  90                  95

Lys Asn Thr Leu Gln Gln Glu Leu Val Asp Phe Leu Leu Pro Ser Phe
            100                 105                 110

Phe Phe Leu Phe Gly Leu Asp Leu Leu Ile Phe Leu Pro Leu Lys Lys
        115                 120                 125

Tyr Val Arg Asp Phe Leu Ala Met Leu Asp Arg Lys Lys Thr Val Leu
    130                 135                 140

Val Thr Ile Leu Ala Thr Leu Leu Phe Leu Arg Asn Pro Met Thr Ile
145                 150                 155                 160

Val Ser Leu Leu Ile Tyr Ile Gly Leu Gly Leu Phe Phe Ala Ala Tyr
                165                 170                 175

Leu Val Pro Asn Ser Val Lys Lys Glu Val Ser Phe Tyr Gly His Ile
            180                 185                 190

Phe Arg Asp Leu Val Leu Val Ile Val Thr Leu Ile Phe Phe
        195                 200                 205


<210>  384
<211>  702
<212>  PRT
<213>  Streptococcus pneumoniae

<400>  384

Met Lys Ile Pro Met Ile Tyr Gln Met Glu Asn Ser Glu Cys Gly Leu
1               5                   10                  15

Ala Cys Cys Ala Met Ile Leu Asn Tyr Phe Lys Tyr Glu Ile Ser Leu
            20                  25                  30
```

```
Asn Glu Leu Arg Glu Ile Tyr Pro Ser Ser Arg Ser Gly Tyr Ser Leu
        35                  40                  45

Leu Ser Ile Ser Lys Val Leu Gly Asp Phe Asn Ile Ser Ser His Ala
    50                  55                  60

Phe Lys Ala Ser Val Arg Asp Leu Lys Pro Leu Ser Phe Pro Leu Ile
65                  70                  75                  80

Cys Phe Trp Glu Ser Ser His Phe Ile Ile Leu Glu Lys Ile Ser Lys
                85                  90                  95

Asn Lys Phe Tyr Ile Leu Asp Pro Ala Lys Gly Arg Gln Arg Met Ser
            100                 105                 110

Ile Ser Glu Phe Glu Arg His Tyr Ser Asn Ile Ile Leu Thr Phe Lys
        115                 120                 125

Lys Leu Asp Ser Phe Met Ser Arg Lys Asp Asn Lys Lys Ser Pro Val
    130                 135                 140

Leu Lys Tyr Phe Phe Lys Tyr Arg Asn Lys Leu Gly Ile Leu Phe Phe
145                 150                 155                 160

Val Thr Ala Leu Leu Tyr Val Ile Gln Ser Leu Val Pro Ile Ala Asn
                165                 170                 175

Arg Tyr Ile Ile Asp Thr Asn Phe Lys Asp Asp Ser Tyr Ser Ser Arg
            180                 185                 190

Met Leu Phe Thr Ile Leu Phe Ile Phe Thr Val Ser Phe Ser Leu Met
        195                 200                 205

Tyr Leu Leu Arg Gln Ile Tyr Val Ala Ser Leu Lys Tyr Ile Met Asp
    210                 215                 220

Lys Glu Ile Ser Tyr Asp Phe Met Lys His Leu Ile Tyr Leu Pro Tyr
225                 230                 235                 240

Ser Phe Tyr Glu Lys Arg Thr Leu Gly Asp Ile Leu Phe Arg Ala Asn
                245                 250                 255
```

```
Ser Ile Val Tyr Ile Arg Glu Ile Leu Ser Asn Asn Phe Ile Ala Ala
            260                 265                 270

Ile Leu Asp Leu Leu Met Ile Val Val Tyr Ala Val Val Leu Phe Ser
        275                 280                 285

Phe Ser Lys Tyr Met Val Ile Phe Leu Ile Ser Leu Ser Leu Ala Leu
    290                 295                 300

Ser Ile Val Met Tyr Pro Ile Ile Lys Ile Ser Lys Asn Leu Ile Asp
305                 310                 315                 320

Lys Asn Ile Lys Glu Lys Val Asn Val Gln Asn Ile Thr Ser Glu Val
                325                 330                 335

Ile Ser Lys Asn Ser Asp Ile Lys Leu Thr Gly Glu Glu Glu Phe Trp
            340                 345                 350

Ile Asn Lys Trp Asp Asn Phe Asn Thr Lys Gln Leu Ile Ile Gly Arg
        355                 360                 365

Lys Leu Asp Ile His Leu Ser Ile Val Ser Ser Ile Thr Asn Val Leu
    370                 375                 380

Gln Ile Ile Leu Pro Val Leu Thr Leu Ile Val Gly Val Asn Ile Lys
385                 390                 395                 400

Thr Phe Glu Gln Leu Thr Leu Gly Gln Ile Val Ala Ile Ser Thr Val
                405                 410                 415

Ser Pro Tyr Phe Ile Ser Pro Ile Ile Ser Leu Ser Asp Asn Tyr Ile
            420                 425                 430

Gln Leu Met Leu Leu Lys Gly Tyr Phe Leu Arg Ile Glu Asp Val Phe
        435                 440                 445

Asn Thr Lys Ser Glu Leu Ile Pro Glu Arg Val Ser Gln Asp Ile Lys
    450                 455                 460

Phe Asp Lys Lys Ile Glu Leu Lys Asp Ile Trp Tyr Lys Tyr Gly Leu
```

```
465                 470                 475                 480

Phe Asp Asp Tyr Val Leu Lys Gly Ile Asn Val Thr Ile Lys Lys Gly
                485                 490                 495

Glu Thr Val Ala Ile Val Gly Glu Ser Gly Ser Gly Lys Ser Thr Leu
            500                 505                 510

Ala Lys Ile Leu Leu Gly Leu Leu Glu Pro Asn Ile Gly Ser Ile Glu
        515                 520                 525

Val Asp Gly Val Glu Lys Glu Glu Ile Gly Gln Thr Leu Tyr Arg Lys
    530                 535                 540

Ile Phe Gly Ala Val Leu Gln Asn Ser Thr Leu Ser Tyr Gly Thr Leu
545                 550                 555                 560

Arg Glu Asn Leu Thr Phe Gly His Phe Val Ser Asp Glu Glu Leu Met
                565                 570                 575

Thr Asn Leu Asn Ser Ile Gly Leu Ser Asn Val Val Lys Ser Leu Pro
            580                 585                 590

Leu Gly Leu Glu Thr Ile Ile Ala Glu Glu Gly Asn Asn Phe Ser Gly
        595                 600                 605

Gly Gln Gln Gln Met Ile Leu Leu Ala Arg Cys Leu Leu Ser Lys Pro
    610                 615                 620

Ser Val Val Val Leu Asp Glu Ala Thr Ser Ser Leu Asp Asn Leu Ser
625                 630                 635                 640

Gln Gln Ile Thr Thr Ser Tyr Leu Ser Glu Ile Gly Thr Thr Lys Ile
                645                 650                 655

Leu Ile Ala His Arg Leu Asp Thr Ile Lys Ser Ala Asp Lys Ile Leu
            660                 665                 670

Val Met His Asn Gly Glu Ile Val Glu Ile Gly Thr His Arg Glu Leu
        675                 680                 685
```

```
Leu Glu Leu Gly Gly Ile Tyr Lys Gln Leu Tyr Ser Asn Asn
    690                 695                 700


<210>  385
<211>  103
<212>  PRT
<213>  Streptococcus pneumoniae

<400>  385

Met Leu Asn Ile Pro Asn Val Leu Arg Tyr Asp Leu Asn Met Leu Gln
1               5                  10                  15


Leu Glu Tyr Lys Asn Glu Gln Ser Trp Asp Ser Phe Ile Asp Asn Val
            20                  25                  30


Asn Leu Ile Glu Leu Glu Glu Arg Ile Gln Thr Thr Ile Gly Ile Lys
        35                  40                  45


Gln Ile Asn Thr His Asn Ile Ile Thr Ile Ala Arg Glu Gly Tyr Ser
    50                  55                  60


Gln Asn Tyr Leu Pro Asn Thr Ser Glu Asn Thr Tyr Asn Ser Leu Gln
65                  70                  75                  80


Val Ser Leu Val Gly Val Leu Leu Leu Phe Ile Ser Met Val Asn Ile
                85                  90                  95


Leu Trp Ala Lys Lys Ser Lys
            100


<210>  386
<211>  210
<212>  PRT
<213>  Streptococcus pneumoniae

<400>  386

Met Ile Glu Leu Lys Gln Val Ser Lys Ser Phe Gly Glu Arg Glu Leu
1               5                  10                  15


Phe Ser Asn Leu Ser Met Thr Phe Glu Ala Gly Lys Val Tyr Ala Leu
            20                  25                  30


Ile Gly Ser Ser Gly Ser Gly Lys Thr Thr Leu Met Asn Met Ile Gly
```

```
        35                  40                  45

Lys Leu Glu Pro Tyr Asp Gly Thr Ile Phe Tyr Arg Gly Lys Asp Leu
    50                  55                  60

Ala Asn Tyr Lys Ser Ser Asp Phe Phe Arg His Glu Leu Gly Tyr Leu
65                  70                  75                  80

Phe Gln Asn Phe Gly Leu Ile Glu Asn Gln Ser Ile Glu Glu Asn Leu
                85                  90                  95

Lys Leu Gly Leu Ile Gly Gln Lys Leu Ser Arg Ser Glu Gln Arg Leu
            100                 105                 110

Arg Gln Lys Gln Ala Leu Glu Gln Val Gly Leu Val Tyr Leu Asp Leu
        115                 120                 125

Asp Lys Arg Ile Phe Glu Leu Ser Gly Gly Glu Ser Gln Arg Val Ala
    130                 135                 140

Leu Ala Lys Ile Ile Leu Lys Asn Pro Pro Phe Ile Leu Ala Asp Glu
145                 150                 155                 160

Pro Thr Ala Ser Ile Asp Pro Ala Thr Ser Gln Leu Ile Met Glu Ile
                165                 170                 175

Leu Leu Ser Leu Arg Asp Asp Asn Arg Leu Ile Ile Ile Ala Thr His
            180                 185                 190

Asn Pro Ala Ile Trp Glu Met Ala Asp Glu Val Phe Thr Met Asp His
        195                 200                 205

Leu Lys
    210
```

<210> 387
<211> 345
<212> PRT
<213> Streptococcus pneumoniae

<400> 387

Met Lys Lys Lys Ile Arg Trp Pro Leu Tyr Val Ile Ala Ala Leu Ile

```
1               5                   10                  15

Val Thr Phe Leu Ala Phe Val Val Pro Leu Pro Tyr Tyr Ile Glu Val
            20                  25                  30

Pro Gly Gly Ser Glu Asp Ile Arg Gln Val Leu Lys Val Asn Asp Thr
        35                  40                  45

Glu Asp Lys Glu Ala Gly Ala Tyr Gln Phe Val Thr Val Gly Val Gln
    50                  55                  60

His Ala Thr Leu Ala His Met Ile Tyr Ala Trp Leu Thr Pro Phe Thr
65                  70                  75                  80

Asp Ile Arg Ser Ala Gln Glu Thr Thr Gly Gly Ser Ser Asp Val Glu
                85                  90                  95

Phe Met Arg Ile Asn Gln Phe Tyr Met Gln Thr Ser Gln Asn Met Ala
            100                 105                 110

Lys Tyr Gln Gly Leu Lys Thr Ala Gly Lys Asp Ile Glu Leu Lys Tyr
        115                 120                 125

Phe Gly Val Tyr Val Leu Asn Val Thr Asp Asn Ser Thr Phe Lys Gly
    130                 135                 140

Ile Leu Asn Ile Ser Asp Thr Val Thr Ala Val Asn Asp Gln Thr Phe
145                 150                 155                 160

Asp Ser Ser Lys Asp Leu Ile Asp Tyr Val Ser Ser Gln Lys Leu Gly
                165                 170                 175

Asp Ser Val Lys Val Thr Tyr Glu Glu Asp Gly Gln Thr Lys Ser Ala
            180                 185                 190

Glu Gly Lys Ile Ile Thr Leu Glu Asn Gly Lys Asn Gly Ile Gly Ile
        195                 200                 205

Gly Leu Ile Asp Arg Thr Glu Val Ile Ser Asn Val Pro Ile Ser Phe
    210                 215                 220
```

```
Ser Thr Ala Gly Ile Gly Gly Pro Ser Ala Gly Leu Met Phe Ser Leu
225                 230                 235                 240

Ala Ile Tyr Thr Gln Ile Ala His Pro Asp Leu Arg Asn Gly Arg Ile
                245                 250                 255

Val Ala Gly Thr Gly Thr Ile Asp Arg Asp Gly Asn Val Gly Asp Ile
            260                 265                 270

Gly Gly Ile Asp Lys Lys Val Val Ala Ser Ala Arg Ala Gly Ala Ala
        275                 280                 285

Ile Phe Phe Ala Pro Asp Asn Pro Val Ser Glu Glu Glu Gln Lys Ala
    290                 295                 300

His Pro Asp Ala Lys Asn Asn Tyr Gln Thr Ala Leu Glu Ala Ala Lys
305                 310                 315                 320

Thr Ile Lys Thr Asp Met Lys Ile Val Pro Val Lys Thr Leu Gln Asp
                325                 330                 335

Ala Ile Asp Tyr Leu Lys Asn Asn Pro
            340                 345


<210>  388
<211>  308
<212>  PRT
<213>  Streptococcus pneumoniae

<400>  388

Met Lys Ser Ile Lys Arg Phe Ala Leu Ser Ala Met Gly Val Ala Met
1               5                   10                  15

Leu Leu Val Leu Thr Gly Cys Val Asn Val Asp Lys Thr Thr Gly Gln
            20                  25                  30

Pro Thr Gly Phe Ile Trp Asn Thr Ile Gly Ala Pro Met Ala Glu Ala
        35                  40                  45

Ile Lys Tyr Phe Ala Thr Asp Lys Gly Leu Gly Phe Gly Val Ala Ile
    50                  55                  60
```

```
Ile Ile Val Thr Ile Ile Val Arg Leu Ile Ile Leu Pro Leu Gly Ile
65                  70                  75                  80

Tyr Gln Ser Trp Lys Ala Thr Leu His Ser Glu Lys Met Asn Ala Leu
                85                  90                  95

Lys His Val Leu Glu Pro His Gln Thr Arg Leu Lys Glu Ala Thr Thr
            100                 105                 110

Gln Glu Glu Lys Leu Glu Ala Gln Gln Ala Leu Phe Ala Ala Gln Lys
        115                 120                 125

Glu His Gly Ile Ser Met Phe Gly Gly Val Gly Cys Phe Pro Ile Leu
    130                 135                 140

Leu Gln Met Pro Phe Phe Ser Ala Ile Tyr Phe Ala Ala Gln His Thr
145                 150                 155                 160

Glu Gly Val Ala Gln Ala Ser Tyr Leu Gly Ile Pro Leu Gly Ser Pro
                165                 170                 175

Ser Met Ile Leu Val Ala Cys Ala Gly Val Leu Tyr Tyr Leu Gln Ser
            180                 185                 190

Leu Leu Ser Leu His Gly Val Glu Asp Glu Met Gln Arg Glu Gln Ile
        195                 200                 205

Lys Lys Met Ile Tyr Met Ser Pro Leu Met Ile Val Val Phe Ser Leu
    210                 215                 220

Phe Ser Pro Ala Ser Val Thr Leu Tyr Trp Val Val Gly Gly Phe Met
225                 230                 235                 240

Met Ile Leu Gln Gln Phe Ile Val Asn Tyr Ile Val Arg Pro Lys Leu
                245                 250                 255

Arg Lys Lys Val Arg Glu Glu Leu Ala Lys Asn Pro Pro Lys Ala Ser
            260                 265                 270

Ala Phe Ser Lys Pro Ser Gly Arg Lys Asp Val Thr Pro Glu Gln Pro
        275                 280                 285
```

```
Thr Ala Ile Thr Ser Lys Lys Lys His Lys Asn Arg Asn Ala Gly Lys
    290                 295                 300

Gln Arg Ser Arg
305
```

<210> 389
<211> 213
<212> PRT
<213> Streptococcus pneumoniae

<400> 389

```
Met Ile Asp Ile Gln Gly Leu Glu Lys Lys Phe Asn Asp Arg Ala Ile
1               5                   10                  15

Phe Ser Gly Leu Asn Leu Lys Leu Glu Lys Gly Lys Val Tyr Ala Leu
            20                  25                  30

Ile Gly Lys Ser Gly Ser Gly Lys Thr Thr Leu Leu Asn Ile Leu Gly
        35                  40                  45

Lys Leu Glu Lys Ile Asp Gly Gly Arg Val Leu Tyr Gln Gly Lys Asp
    50                  55                  60

Leu Lys Thr Ile Pro Thr Arg Glu Tyr Phe Arg Asp Gln Met Gly Tyr
65                  70                  75                  80

Leu Phe Gln Asn Phe Gly Leu Leu Glu Asn Gln Ser Ile Lys Glu Asn
                85                  90                  95

Leu Asp Leu Gly Phe Val Gly Gln Lys Ile Ser Lys Val Glu Arg Leu
            100                 105                 110

Glu Arg Gln Val Gly Ala Leu Glu Lys Val Asn Leu Gly Tyr Leu Asp
        115                 120                 125

Leu Glu Gln Lys Ile Tyr Thr Leu Ser Gly Gly Glu Ala Gln Arg Val
    130                 135                 140

Ala Leu Ala Lys Thr Ile Leu Lys Asn Pro Pro Leu Ile Leu Ala Asp
145                 150                 155                 160
```

```
Glu Pro Thr Ala Ala Leu Asp Pro Glu Asn Ser Glu Glu Val Met Asn
                165                 170                 175

Leu Leu Val Asp Leu Lys Asp Glu Asn Arg Ile Ile Ile Ile Ala Thr
            180                 185                 190

His Asn Pro Leu Val Trp Asn Lys Ala Asp Glu Ile Ile Asp Met Arg
        195                 200                 205

Lys Leu Ala His Val
    210
```

<210> 390
<211> 680
<212> PRT
<213> Streptococcus pneumoniae

<400> 390

```
Met Glu Glu Met Met Lys Arg Leu Phe Ile Leu Ile Ser Met Val Leu
1               5                   10                  15

Val Ser Leu Tyr Met Val Ile Thr Ser Val Asp His Arg Glu Glu Ile
            20                  25                  30

Leu Phe Gly Asn Tyr Pro Ser Val Asp Val Thr Gly Met Met Ile Asn
        35                  40                  45

Gln Pro Val Ala Ser Arg Glu Glu Val Thr Glu Ala Leu Ser His Leu
    50                  55                  60

Ala Val Glu His Asn Ser Leu Ile Ala Arg Arg Ile Val Glu Pro Asn
65                  70                  75                  80

Glu Ala Gly Glu Thr Arg Phe Thr Tyr Ala Thr Tyr Gly Glu Gly Lys
                85                  90                  95

Leu Pro Glu Gly Leu Thr Ile Ser Ser Lys Glu Ser Ala Glu Thr Ser
            100                 105                 110

Asp Leu Leu Gly Ser Tyr Leu Ile Val Ser Gly Ser Leu Asp Gly Val
        115                 120                 125
```

```
Ser Leu Gln Thr Thr Leu Lys Glu Leu Gly Tyr Gln Gly Phe Val Ser
    130                 135                 140

Asn Gly Glu Asp Pro Phe Ser Ile Val Leu Leu Leu Thr Ala Thr Pro
145                 150                 155                 160

Met Val Leu Leu Ser Leu Ala Ile Phe Leu Leu Thr Phe Met Ser Leu
                165                 170                 175

Thr Leu Ile Tyr Arg Ile Lys Ser Leu Arg Gln Ala Gly Ile Arg Leu
            180                 185                 190

Ile Ala Gly Glu Ser Leu Phe Gly Val Ala Leu Arg Pro Val Leu Glu
        195                 200                 205

Asp Val Arg Gln Leu Ile Cys Ser Val Leu Val Ser Ser Leu Leu Gly
    210                 215                 220

Leu Gly Ile Leu Trp Tyr Gln Gly Ala Leu Phe Met Ala Thr Val Gln
225                 230                 235                 240

Leu Val Ile Ile Ala Leu Leu Leu Tyr Gly Leu Thr Leu Ala Gly Ile
                245                 250                 255

Ser Thr Leu Leu Ser Val Val Tyr Leu Leu Gly Leu Gln Glu Asn Ser
            260                 265                 270

Leu Val Asp Leu Leu Lys Gly Lys Leu Pro Leu Lys Arg Met Met Thr
        275                 280                 285

Leu Met Met Val Gly Gln Leu Leu Ala Val Leu Val Val Gly Ser Ser
    290                 295                 300

Ala Thr Ala Leu Leu Pro His Tyr Arg Glu Met Gln Glu Met Glu Arg
305                 310                 315                 320

Ala Ser Asn Lys Trp Ser Gln Ser Ser Asp Arg Tyr Arg Leu Ser Phe
                325                 330                 335

Gly Trp Ser Ser Ala Phe Ala Asp Glu Glu Gly Thr Arg Lys Asp Asn
            340                 345                 350
```

```
Arg Glu Trp Gln Thr Phe Thr Glu Glu Arg Leu Ala Asn Thr Asp Ser
        355                 360                 365

Phe Tyr Ile Met Ser Asn Val Asp Asn Phe Ser Asp Gly Ala Glu Val
    370                 375                 380

Asp Leu Asp Gly Asn Arg Leu Ser Asp Tyr Thr Pro Ser Gly Asn Val
385                 390                 395                 400

Ile Tyr Val Ser Pro Arg Tyr Leu Ile Glu Glu Lys Ile Thr Val Ser
                405                 410                 415

Ser Glu Phe Met Asp Lys Met Gln Asn Leu Ser Glu Gly Glu Phe Gly
            420                 425                 430

Leu Ile Leu Pro Glu Ser Leu Arg Glu Gln Ser Val Tyr Tyr Gln Gly
        435                 440                 445

Leu Phe Thr Asp Tyr Leu Gln Asn Phe Ser Ser Glu Ser Val Glu Val
    450                 455                 460

Thr Ser Gln Lys His Tyr Leu Pro Gln Val Arg Leu Ala Phe Thr Glu
465                 470                 475                 480

Thr Gly Gln Glu Arg Phe Leu Tyr Asn Asp Gly Tyr Lys Thr Thr Arg
                485                 490                 495

Gln Tyr Leu Lys Asp Pro Ile Ile Val Val Leu Thr Pro Gln Ala Thr
            500                 505                 510

Gly Thr Arg Pro Val Ala Gly Met Leu Trp Gly Thr Thr Ala Asn Ser
        515                 520                 525

Ala Leu Lys Leu Asp Arg Tyr Gly Asp Ser Ile Thr Ala Leu Lys Glu
    530                 535                 540

Lys Gly Leu Tyr His Lys Val Ser Tyr Leu Val Lys Ser Gln Leu Phe
545                 550                 555                 560

Phe Ala Lys Val Leu Asn Asp Lys Arg Val Glu Phe Tyr Ser Leu Leu
```

565 570 575

Ile Gly Thr Ile Leu Thr Leu Ser Thr Ala Ile Leu Leu Phe Asp Ser
580 585 590

Met Asn Leu Leu Tyr Phe Glu Gln Phe Arg Arg Glu Leu Met Ile Lys
595 600 605

Arg Leu Ala Gly Met Thr Ile Tyr Glu Leu His Gly Lys Tyr Leu Leu
610 615 620

Ala Gln Gly Gly Val Leu Leu Leu Gly Leu Val Leu Ser Ser Ile Leu
625 630 635 640

Thr Arg Asp Gly Leu Ile Ser Ala Leu Val Val Ala Leu Phe Thr Leu
645 650 655

Asn Ala Leu Leu Ile Leu Val Arg Gln Asp Lys Lys Glu Glu Ala Gly
660 665 670

Ser Met Ala Val Leu Lys Gly Lys
675 680

<210> 391
<211> 294
<212> PRT
<213> Streptococcus pneumoniae

<400> 391

Met Asn Met Ile Lys Val Glu Ser Leu Asn Lys Asn Ile Lys Gly Lys
1 5 10 15

Ala Ile Leu Lys Gly Ile Ser Phe Glu Val Ala Glu Gly Glu Cys Val
20 25 30

Ala Leu Ile Gly Pro Asn Gly Ala Gly Lys Thr Thr Leu Leu Asp Cys
35 40 45

Leu Leu Gly Asp Lys Leu Val Thr Ser Gly Gln Val Ser Ile Gln Gly
50 55 60

Leu Ser Val Thr Ser Ser Gln Leu Asp Tyr Ile Arg Gly Tyr Leu Pro

65 70 75 80

Gln Glu Asn Val Ile Val Gln Lys Leu Lys Val Lys Glu Leu Ile Ala
85 90 95

Phe Phe Gln Arg Ile Tyr Pro Asn Ser Leu Ser Asp Gln Glu Ile Asp
100 105 110

Gln Leu Leu Gln Phe Asp Gln Gln Gln Lys Glu Gln Phe Ala Glu Lys
115 120 125

Leu Ser Gly Gly Gln Lys Arg Leu Phe Ser Phe Val Leu Thr Leu Ile
130 135 140

Gly Arg Pro Lys Leu Val Phe Leu Asp Glu Pro Thr Ala Ala Met Asp
145 150 155 160

Thr Ser Thr Arg Gln Arg Phe Trp Glu Ile Val Arg Asp Leu Lys Ala
165 170 175

Gln Gly Val Thr Ile Leu Tyr Ser Ser His Tyr Ile Glu Glu Val Glu
180 185 190

His Thr Ala Asp Arg Ile Leu Val Leu Asn Lys Gly Glu Leu Ile Arg
195 200 205

Asp Thr Thr Pro Leu Ala Met Arg Ser Glu Gly Ile Glu Lys His Phe
210 215 220

Ile Leu Pro Leu Ala Tyr Lys Glu Val Ile Glu Gln Ser Asn Leu Val
225 230 235 240

Glu Asn Trp Ser Gln Lys Gln Asp Ala Leu Gln Val Val Thr Arg Glu
245 250 255

Ala Asp Ala Phe Trp Glu Leu Leu Val Gln Ala Gly Cys Gly Ile Gln
260 265 270

Glu Ile Glu Val Asn Asn Arg Ser Leu Leu Asp Thr Ile Phe Glu Glu
275 280 285

Thr Gln Lys Gly Asp Asn
290

<210> 392
<211> 431
<212> PRT
<213> Streptococcus pneumoniae

<400> 392

Met Lys Asn Ser Lys Phe Ile Asp Gln Phe Ala Thr Phe Ala Gly Lys
1 5 10 15

Leu Gly Asn Gln Ile His Leu Lys Thr Leu Arg Asp Ala Phe Val Thr
20 25 30

Val Met Pro Leu Tyr Ile Leu Ala Gly Leu Ile Val Leu Leu Asn Asn
35 40 45

Thr Val Phe Lys Trp Ile Phe Gln Gly Asp Thr Leu Thr Arg Phe Gln
50 55 60

Tyr Trp Gly Ile Thr Ile Ala Asn Gly Thr Leu Ser Ile Ser Gly Met
65 70 75 80

Ile Ile Ala Val Met Val Gly Tyr Phe Leu Ala Lys Asn Arg Asp Phe
85 90 95

Glu Asn Pro Leu Ala Ala Ser Met Leu Ser Leu Val Ser Leu Ile Val
100 105 110

Met Met Pro Asn Thr Val Ser Val Val Pro Asp Gly Ala Lys Asp Ala
115 120 125

Val Asn Ile Ser Gly Val Leu Ser Phe Asn Asn Thr Gly Thr Gly Ala
130 135 140

Met Phe Ala Gly Val Ile Val Ala Ile Ile Ala Thr Glu Leu Phe Ile
145 150 155 160

Glu Leu Ser Asn Val Lys Ala Leu Gln Met Asn Leu Gly Glu Asn Ile
165 170 175

```
Pro Pro Ala Val Ser Arg Ser Phe Ser Val Leu Leu Pro Val Met Thr
            180                 185                 190

Val Ile Ser Leu Phe Gly Val Val Ser Ala Leu Leu Phe Asn Ile Thr
        195                 200                 205

Gly Met Asn Leu Ile Ser Ile Ile Thr Ile Phe Ile Gln Glu Pro Ile
    210                 215                 220

Arg His Ile Gly Thr Ser Leu Ile Gly Val Ile Ile Ile Tyr Ser Leu
225                 230                 235                 240

Gly Asn Met Leu Trp Leu Phe Gly Ile His Gln Ala Val Ile Tyr Ser
                245                 250                 255

Ala Ile Leu Glu Pro Leu Leu Leu Ile Asn Ile Thr Glu Asn Ile Thr
            260                 265                 270

Ala Ala Asn Asn Gly Gln Ala Ile Pro His Ile Ile Asn Leu Ser Gln
        275                 280                 285

Ile Gln Thr Phe Ala Leu Met Gly Gly Ser Gly Ser Thr Leu Cys Leu
    290                 295                 300

Leu Ile Ala Thr Phe Leu Val Ser Arg Asn Ala Val Ser Lys Asn Val
305                 310                 315                 320

Ala Lys Leu Ser Phe Gly Pro Gly Ile Phe Asn Ile Asn Glu Pro Val
                325                 330                 335

Leu Phe Gly Tyr Pro Ile Val Tyr Asn Ile Ser Leu Ala Ile Pro Phe
            340                 345                 350

Ile Thr Val Pro Val Leu Gly Ile Leu Ile Ser Tyr Leu Ala Thr Val
        355                 360                 365

Thr Glu Phe Met Ser Pro Ala Phe Ile Gln Val Pro Trp Thr Thr Pro
    370                 375                 380

Val Phe Leu Asn Ala Trp Leu Ala Thr Ala Gly Asp Val Arg Ala Val
385                 390                 395                 400
```

```
Leu Val Gln Phe Ile Ile Phe Ala Leu Gly Val Leu Leu Tyr Ile Pro
                405                 410                 415

Phe Ile Lys Val Asn Asp Lys Val Val Glu Gln Glu Met Glu Gly
            420                 425                 430
```

<210> 393
<211> 890
<212> PRT
<213> Streptococcus pneumoniae

<400> 393

```
Met Lys Ala Met Glu Glu Asn Met Ala Asp Lys Lys Thr Val Thr Pro
1               5                   10                  15

Glu Glu Lys Lys Leu Val Ala Glu Lys His Val Asp Glu Leu Val Gln
            20                  25                  30

Lys Ala Leu Val Ala Leu Glu Glu Met Arg Lys Leu Asp Gln Glu Gln
        35                  40                  45

Val Asp Tyr Ile Val Ala Lys Ala Ser Val Ala Ala Leu Asp Ala His
    50                  55                  60

Gly Glu Leu Ala Leu His Ala Phe Glu Glu Thr Gly Arg Gly Val Phe
65                  70                  75                  80

Glu Asp Lys Ala Thr Lys Asn Leu Phe Ala Cys Glu His Val Val Asn
                85                  90                  95

Asn Met Arg His Thr Lys Thr Val Gly Val Ile Glu Glu Asp Asp Val
            100                 105                 110

Thr Gly Leu Thr Leu Ile Ala Glu Pro Val Gly Val Val Cys Gly Ile
        115                 120                 125

Thr Pro Thr Thr Asn Pro Thr Ser Thr Ala Ile Phe Lys Ser Leu Ile
    130                 135                 140

Ser Leu Lys Thr Arg Asn Pro Ile Val Phe Ala Phe His Pro Ser Ala
145                 150                 155                 160
```

```
Gln Glu Ser Ser Ala His Ala Ala Arg Ile Val Arg Asp Ala Ala Ile
                165                 170                 175

Ala Ala Gly Ala Pro Glu Asn Cys Val Gln Trp Ile Thr Gln Pro Ser
            180                 185                 190

Met Glu Ala Thr Ser Ala Leu Met Asn His Glu Gly Val Ala Thr Ile
        195                 200                 205

Leu Ala Thr Gly Gly Asn Ala Met Val Lys Ala Ala Tyr Ser Cys Gly
    210                 215                 220

Lys Pro Ala Leu Gly Val Gly Ala Gly Asn Val Pro Ala Tyr Val Glu
225                 230                 235                 240

Lys Ser Ala Asn Ile Arg Gln Ala Ala His Asp Ile Val Met Ser Lys
                245                 250                 255

Ser Phe Asp Asn Gly Met Val Cys Ala Ser Glu Gln Ala Val Ile Ile
            260                 265                 270

Asp Lys Glu Ile Tyr Asp Glu Phe Val Ala Glu Phe Lys Ser Tyr His
        275                 280                 285

Thr Tyr Phe Val Asn Lys Lys Glu Lys Ala Leu Leu Glu Glu Phe Cys
    290                 295                 300

Phe Gly Val Lys Ala Asn Ser Lys Asn Cys Ala Gly Ala Lys Leu Asn
305                 310                 315                 320

Ala Asp Ile Val Gly Lys Pro Ala Thr Trp Ile Ala Glu Gln Ala Gly
                325                 330                 335

Phe Thr Val Pro Glu Gly Thr Asn Ile Leu Ala Ala Glu Cys Lys Glu
            340                 345                 350

Val Gly Glu Asn Glu Pro Leu Thr Arg Glu Lys Leu Ser Pro Val Ile
        355                 360                 365

Ala Val Leu Lys Ser Glu Ser Arg Glu Asp Gly Ile Thr Lys Ala Arg
    370                 375                 380
```

```
Gln Met Val Glu Phe Asn Gly Leu Gly His Ser Ala Ala Ile His Thr
385                 390                 395                 400

Ala Asp Glu Glu Leu Thr Lys Glu Phe Gly Lys Ala Val Lys Ala Ile
                405                 410                 415

Arg Val Ile Cys Asn Ser Pro Ser Thr Phe Gly Gly Ile Gly Asp Val
            420                 425                 430

Tyr Asn Ala Phe Leu Pro Ser Leu Thr Leu Gly Cys Gly Ser Tyr Gly
        435                 440                 445

Arg Asn Ser Val Gly Asp Asn Val Ser Ala Ile Asn Leu Leu Asn Ile
    450                 455                 460

Lys Lys Val Gly Arg Arg Arg Asn Asn Met Gln Trp Met Lys Leu Pro
465                 470                 475                 480

Ser Lys Thr Tyr Phe Glu Arg Asp Ser Ile Gln Tyr Leu Gln Lys Cys
                485                 490                 495

Arg Asp Val Glu Arg Val Met Ile Val Thr Asp His Ala Met Val Glu
            500                 505                 510

Leu Gly Phe Leu Asp Arg Ile Ile Glu Gln Leu Asp Leu Arg Arg Asn
        515                 520                 525

Lys Val Val Tyr Gln Ile Phe Ala Asp Val Glu Pro Asp Pro Asp Ile
    530                 535                 540

Thr Thr Val Asn Arg Gly Thr Glu Ile Met Arg Ala Phe Lys Pro Asp
545                 550                 555                 560

Thr Ile Ile Ala Leu Gly Gly Gly Ser Pro Met Asp Ala Ala Lys Val
                565                 570                 575

Met Trp Leu Phe Tyr Glu Gln Pro Glu Val Asp Phe Arg Asp Leu Val
            580                 585                 590

Gln Lys Phe Met Asp Ile Arg Lys Arg Ala Phe Lys Phe Pro Leu Leu
```

595 600 605

Gly Lys Lys Thr Lys Phe Ile Ala Ile Pro Thr Thr Ser Gly Thr Gly
610 615 620

Ser Glu Val Thr Pro Phe Ala Val Ile Ser Asp Lys Ala Asn Asn Arg
625 630 635 640

Lys Tyr Pro Ile Ala Asp Tyr Ser Leu Thr Pro Thr Val Ala Ile Val
645 650 655

Asp Pro Ala Leu Val Leu Thr Val Pro Gly Phe Val Ala Ala Asp Thr
660 665 670

Gly Met Asp Val Leu Thr His Ala Thr Glu Ala Tyr Val Ser Gln Met
675 680 685

Ala Ser Asp Tyr Thr Asp Gly Leu Ala Leu Gln Ala Ile Lys Leu Val
690 695 700

Phe Glu Asn Leu Glu Ser Ser Val Lys Asn Ala Asp Phe His Ser Arg
705 710 715 720

Glu Lys Met His Asn Ala Ser Thr Ile Ala Gly Met Ala Phe Ala Asn
725 730 735

Ala Phe Leu Gly Ile Ser His Ser Met Ala His Lys Ile Gly Ala Gln
740 745 750

Phe His Thr Ile His Gly Arg Thr Asn Ala Ile Leu Leu Pro Tyr Val
755 760 765

Ile Arg Tyr Asn Gly Thr Arg Pro Ala Lys Thr Ala Thr Trp Pro Lys
770 775 780

Tyr Asn Tyr Tyr Arg Ala Asp Glu Lys Tyr Gln Asp Ile Ala Arg Met
785 790 795 800

Leu Gly Leu Pro Ala Ser Thr Pro Glu Glu Gly Val Glu Ser Tyr Ala
805 810 815

```
Lys Ala Val Tyr Glu Leu Gly Glu Arg Ile Gly Ile Gln Met Asn Phe
            820                 825                 830

Arg Asp Gln Gly Ile Asp Glu Lys Glu Trp Lys Glu His Ser Arg Lys
        835                 840                 845

Leu Ala Phe Leu Ala Tyr Glu Asp Gln Cys Ser Pro Ala Asn Pro Arg
    850                 855                 860

Leu Pro Met Val Asp His Met Gln Glu Ile Ile Glu Asp Ala Tyr Tyr
865                 870                 875                 880

Gly Tyr Lys Glu Arg Pro Gly Arg Arg Lys
                885                 890
```

<210> 394
<211> 99
<212> PRT
<213> Streptococcus pneumoniae

<400> 394

```
Met Asn Pro Asn Ile Thr Phe Leu Ile Met Leu Val Gly Met Met Ala
1               5                   10                  15

Leu Met Phe Phe Met Gln Arg Ser Gln Lys Lys Gln Ala Gln Lys Arg
            20                  25                  30

Met Glu Ser Leu Asn Lys Leu Gln Lys Gly Tyr Glu Val Ile Thr Ile
        35                  40                  45

Gly Gly Leu Tyr Gly Thr Val Asp Glu Val Asp Thr Glu Lys Gly Thr
    50                  55                  60

Ile Val Leu Asp Val Asp Gly Val Tyr Leu Thr Phe Glu Leu Ala Ala
65                  70                  75                  80

Ile Lys Thr Val Leu Pro Leu Lys Glu Thr Ala Ser Leu Glu Gly Ala
                85                  90                  95

Ile Glu Lys
```

<210> 395
<211> 605
<212> PRT
<213> Streptococcus pneumoniae

<400> 395

Met Arg Ile Lys Trp Phe Ser Leu Ile Arg Ile Ile Gly Leu Leu Leu
1 5 10 15

Val Leu Leu Tyr His Phe Phe Gln Thr Ile Phe Pro Gly Gly Phe Phe
20 25 30

Gly Val Asp Val Phe Phe Thr Phe Ser Gly Phe Leu Ile Thr Ala Leu
35 40 45

Leu Ile Glu Glu Phe Ser Lys Asn Asn Glu Ile Asp Leu Ile Gly Phe
50 55 60

Phe Arg Arg Arg Phe Tyr Arg Ile Val Pro Pro Val Val Leu Met Val
65 70 75 80

Leu Val Thr Met Pro Phe Thr Phe Leu Val Arg Gln Asp Tyr Val Ala
85 90 95

Gly Ile Gly Gly Gln Ile Ala Gly Val Leu Gly Phe Met Thr Asn Phe
100 105 110

Tyr Glu Leu Leu Thr Gly Gly Ser Tyr Glu Ser Gln Phe Ile Pro His
115 120 125

Leu Phe Val His Asn Trp Ser Leu Ala Val Glu Val His Tyr Tyr Ile
130 135 140

Leu Trp Gly Leu Ala Val Trp Phe Leu Ser Lys Gln Ala Lys Ser Asn
145 150 155 160

Gly Gln Leu Lys Gly Met Val Phe Leu Leu Ser Ala Val Ala Phe Leu
165 170 175

Ile Ser Phe Phe Ser Met Phe Ile Gly Ser Phe Leu Val Thr Ser Tyr
180 185 190

```
Ser Ser Val Tyr Phe Ser Ser Leu Thr His Val Tyr Pro Phe Phe Leu
        195                 200                 205

Gly Ser Met Leu Ala Thr Ile Val Gly Val Arg Gln Thr Thr Ser Leu
    210                 215                 220

Val Lys Gln Leu Asp Lys Ile Trp Asp Leu Arg Lys Thr Leu Val Val
225                 230                 235                 240

Phe Gly Gly Gly Phe Gly Phe Leu Val Leu Leu Thr Phe Phe Val Lys
                245                 250                 255

Phe Thr Tyr Leu Phe Ala Tyr Leu Ile Gly Phe Leu Leu Ala Ser Leu
            260                 265                 270

Ala Ala Leu Ala Met Ile Leu Ala Ala Arg Val Leu His Glu Lys Thr
        275                 280                 285

His His Ile Gln Glu Ser Lys Ile Ile Ser Phe Leu Ala Asp Thr Ser
    290                 295                 300

Tyr Ala Val Tyr Leu Phe His Trp Pro Phe Tyr Ile Ile Phe Ser Gln
305                 310                 315                 320

Leu Thr Ser Asn Leu Leu Ala Val Leu Leu Thr Leu Ile Cys Ser Tyr
                325                 330                 335

Gly Phe Ala Ser Leu Ser Phe Tyr Val Leu Glu Pro Trp Ile Ala Gly
            340                 345                 350

Lys Asn Thr Pro Ile Val Gln Thr Leu Arg Pro Leu Pro Tyr Ile His
        355                 360                 365

Ala Ile Leu Ala Ala Gly Thr Gly Ile Leu Thr Ile Ile Val Cys Thr
    370                 375                 380

Val Thr Leu Leu Ala Pro Gln Val Gly Ala Phe Glu Thr Asp Leu Thr
385                 390                 395                 400

Val Asn Gly Leu Lys Gln Ala Ala Thr Asn Ile Gly Gln Thr Lys Val
                405                 410                 415
```

```
Met Ala Glu Arg Ala Asp Ala Asn Ser Leu Gly Ile Ala Asp Gly Thr
            420                 425                 430

Met Leu Ile Gly Asp Ser Val Ala Leu Arg Ala Asn Thr Ala Leu Gln
        435                 440                 445

Thr Ala Leu Pro Gly Ala Gln Ile Asn Ala Gln Val Ser Val Thr Thr
    450                 455                 460

Lys Thr Ala Asn Glu Ile Met Leu Asn Asn Ser Gln Asn Lys Phe Leu
465                 470                 475                 480

Pro Lys Thr Val Val Ile Ala Thr Gly Val Asn Asn Pro Glu Asn Tyr
                485                 490                 495

Lys Asp Asp Trp Asp Ser Ile Val Lys Asn Leu Pro Lys Gly His His
            500                 505                 510

Met Ile Leu Val Thr Pro Tyr Glu Gly Asp Lys Thr Lys Glu Thr Tyr
        515                 520                 525

Ala Ile Val Glu Lys Ala Ala Ala Tyr Met Arg Glu Leu Ala Glu Lys
    530                 535                 540

Thr Pro Tyr Ile Thr Ile Ala Asp Trp Asn Gln Val Ala Lys Glu His
545                 550                 555                 560

Pro Glu Ile Trp Ala Gly Thr Asp Gln Val His Phe Gly Ser Glu Ser
                565                 570                 575

Ser Thr Ile Glu Ala Gly Ala Lys Leu Tyr Ala Asp Thr Ile Ala Thr
            580                 585                 590

Ala Leu Gln Thr Ala Gln Asp Lys Pro Val Lys Ser Lys
        595                 600                 605
```

<210> 396
<211> 119
<212> PRT
<213> Streptococcus pneumoniae

<400> 396

```
Met Ser Ile Ile Leu Thr Thr Ile Val Ala Leu Glu His Phe Tyr Ile
1               5                  10                  15

Phe Tyr Leu Glu Ser Ile Ala Thr Gln Ser Asp Ala Thr Ser Arg Val
            20                  25                  30

Phe Asn Met Glu Lys Glu Glu Leu Ala His Pro Ser Val Ser Ser Leu
        35                  40                  45

Phe Lys Asn Gln Gly Ile Tyr Lys Ala Leu Leu Gly Val Phe Leu Leu
    50                  55                  60

Tyr Val Ile Tyr Phe Ser Gln Asn Leu Glu Ile Val Thr Ile Phe Val
65                  70                  75                  80

Leu Phe Val Ile Gly Ala Ala Thr Tyr Gly Ser Leu Thr Ala Asp Lys
                85                  90                  95

Lys Ile Ile Leu Lys Gln Gly Gly Ser Ala Ile Leu Ala Leu Ile Ser
            100                 105                 110

Ile Leu Leu Phe Lys Tyr Thr
        115
```

<210> 397
<211> 603
<212> PRT
<213> Streptococcus pneumoniae

<400> 397

```
Met Ala Val Ala Asn Cys Ala Lys Tyr Asn Ile Arg Arg Ser Lys Met
1               5                  10                  15

Lys Thr Val Gln Phe Phe Trp His Tyr Phe Lys Val Tyr Lys Phe Ser
            20                  25                  30

Phe Val Val Val Ile Leu Met Ile Val Leu Ala Thr Phe Ala Gln Ala
        35                  40                  45

Leu Phe Pro Val Phe Ser Gly Gln Ala Val Thr Gln Leu Ala Asn Leu
    50                  55                  60
```

```
Val Gln Ala Tyr Gln Asn Gly Asn Pro Glu Leu Val Trp Gln Ser Leu
65                  70                  75                  80

Ser Gly Ile Met Val Asn Leu Gly Leu Leu Val Leu Val Leu Phe Ile
                85                  90                  95

Ser Ser Val Ile Tyr Met Cys Leu Met Thr Arg Val Ile Ala Glu Ser
            100                 105                 110

Thr Asn Glu Met Arg Lys Gly Leu Phe Gly Lys Leu Ala Gln Leu Thr
        115                 120                 125

Val Ser Phe Phe Asp Arg Arg Gln Asp Gly Asp Ile Leu Ser His Phe
    130                 135                 140

Thr Ser Asp Leu Asp Asn Ile Leu Gln Ala Phe Asn Glu Ser Leu Ile
145                 150                 155                 160

Gln Val Met Ser Asn Ile Val Leu Tyr Ile Gly Leu Ile Leu Val Met
                165                 170                 175

Phe Ser Arg Asn Val Thr Leu Ala Leu Ile Thr Ile Ala Ser Thr Pro
            180                 185                 190

Leu Ala Phe Leu Met Leu Ile Phe Ile Val Lys Met Ala Arg Lys Tyr
        195                 200                 205

Thr Asn Leu Gln Gln Lys Glu Val Gly Lys Leu Asn Ala Tyr Met Asp
    210                 215                 220

Glu Ser Ile Ser Gly Gln Lys Ala Val Ile Val Gln Gly Ile Gln Glu
225                 230                 235                 240

Asp Met Met Ala Gly Phe Leu Glu Gln Asn Glu Arg Val Arg Lys Ala
                245                 250                 255

Thr Phe Lys Gly Arg Met Phe Ser Gly Ile Leu Phe Pro Val Met Asn
            260                 265                 270

Gly Met Ser Leu Ile Asn Thr Ala Ile Val Ile Phe Ala Gly Ser Ala
        275                 280                 285
```

```
Val Leu Leu Asn Asp Lys Ser Ile Glu Thr Ser Thr Ala Leu Gly Leu
    290                 295                 300

Ile Val Met Phe Ala Gln Phe Ser Gln Gln Tyr Tyr Gln Pro Ile Ile
305                 310                 315                 320

Gln Val Ala Ala Ser Trp Gly Ser Leu Gln Leu Ala Phe Thr Gly Ala
                325                 330                 335

Glu Arg Ile Gln Glu Met Phe Asp Ala Glu Glu Glu Ile Arg Pro Glu
            340                 345                 350

Lys Ala Pro Thr Phe Thr Lys Leu Gln Glu Ser Val Glu Ile Ser His
        355                 360                 365

Ile Val Phe Ser Tyr Leu Pro Asp Lys Pro Ile Leu Lys Asp Val Ser
    370                 375                 380

Ile Ser Ala Pro Lys Gly Gln Met Thr Ala Val Val Gly Pro Thr Gly
385                 390                 395                 400

Ser Gly Lys Thr Thr Ile Met Asn Leu Ile Asn Arg Phe Tyr Asp Val
                405                 410                 415

Asp Ala Gly Gly Ile Tyr Phe Asp Gly Lys Asp Ile Arg Gly Tyr Asp
            420                 425                 430

Leu Asp Ser Leu Arg Ser Lys Val Gly Ile Val Leu Gln Asp Ser Val
        435                 440                 445

Leu Phe Ser Gly Thr Ile Arg Asp Asn Ile Arg Phe Gly Val Pro Asp
    450                 455                 460

Ala Ser Gln Glu Met Val Glu Val Ala Ala Lys Ala Thr His Ile His
465                 470                 475                 480

Asp Tyr Ile Glu Ser Leu Pro Asp Lys Tyr Asp Thr Leu Ile Asp Asp
                485                 490                 495

Asp Gln Ser Ile Phe Ser Thr Gly Gln Lys Gln Leu Ile Ser Ile Ala
```

```
            500                 505                 510

Arg Thr Leu Met Thr Asp Pro Glu Val Leu Ile Leu Asp Glu Ala Thr
        515                 520                 525

Ser Asn Val Asp Thr Val Thr Glu Ser Lys Ile Gln His Ala Met Glu
    530                 535                 540

Val Val Val Ala Gly Arg Thr Ser Phe Val Ile Ala His Arg Leu Lys
545                 550                 555                 560

Thr Ile Leu Asn Ala Asp Gln Ile Ile Val Leu Lys Asp Gly Glu Val
                565                 570                 575

Ile Glu Arg Gly Asn His His Glu Leu Leu Lys Leu Gly Gly Phe Tyr
            580                 585                 590

Ser Glu Leu Tyr His Asn Gln Phe Val Phe Glu
        595                 600
```

<210> 398
<211> 250
<212> PRT
<213> Streptococcus pneumoniae

<400> 398

```
Met Gly Thr Phe Ser Val Arg His Leu Asp Leu Phe Tyr Gly Asp Phe
1               5                   10                  15

Gln Ala Leu Lys Asn Ile Ser Ile Gln Leu Pro Glu Arg Gln Ile Thr
            20                  25                  30

Ala Leu Ile Gly Pro Ser Gly Cys Gly Lys Ser Thr Phe Leu Lys Thr
        35                  40                  45

Leu Asn Arg Met Asn Asp Leu Val Pro Ser Cys His Ile Glu Gly Gln
    50                  55                  60

Val Leu Leu Asp Glu Gln Asp Ile Tyr Ser Ser Lys Phe Asn Leu Asn
65                  70                  75                  80

Gln Leu Arg Lys Arg Val Gly Met Val Phe Gln Gln Pro Asn Pro Phe
```

85 90 95

Ala Met Ser Ile Tyr Asp Asn Val Ala Tyr Gly Pro Arg Thr His Gly
100 105 110

Ile Arg Asp Lys Lys Gln Leu Asp Ala Leu Val Glu Lys Ser Leu Lys
115 120 125

Gly Ala Ala Ile Trp Glu Glu Val Lys Asp Asp Leu Lys Lys Ser Ala
130 135 140

Met Ser Leu Ser Gly Gly Gln Gln Gln Arg Leu Cys Ile Ala Arg Ala
145 150 155 160

Leu Ala Val Glu Pro Asp Ile Leu Leu Met Asp Glu Pro Thr Ser Ala
165 170 175

Leu Asp Pro Ile Ser Thr Leu Lys Ile Glu Asp Leu Ile Gln Gln Leu
180 185 190

Lys Lys Asp Tyr Thr Ile Ile Ile Val Thr His Asn Met Gln Gln Ala
195 200 205

Ser Arg Ile Ser Asp Lys Thr Ala Phe Phe Leu Thr Gly Glu Ile Cys
210 215 220

Glu Phe Gly Asp Thr Val Asp Val Phe Thr Asn Pro Lys Asp Gln Arg
225 230 235 240

Thr Glu Asp Tyr Ile Ser Gly Arg Phe Gly
245 250

<210> 399
<211> 226
<212> PRT
<213> Streptococcus pneumoniae

<400> 399

Met Met Lys Glu Ile Phe Asp Arg Arg Tyr Pro Val Thr Ser Phe Phe
1 5 10 15

Leu Leu Val Thr Ala Leu Val Phe Leu Leu Met Leu Val Thr Ala Gly

```
            20                  25                  30

Gly Asn Phe Asp Arg Ala Asp Thr Leu Phe Arg Phe Gly Ala Met Tyr
        35                  40                  45

Gly Pro Ala Ile Arg Leu Phe Pro Glu Gln Val Trp Arg Leu Leu Ser
    50                  55                  60

Ala Ile Phe Val His Ile Gly Trp Glu His Phe Ile Val Asn Met Leu
65                  70                  75                  80

Ser Leu Tyr Tyr Leu Gly Arg Gln Val Glu Glu Ile Phe Gly Ser Lys
                85                  90                  95

Gln Phe Phe Phe Leu Tyr Leu Leu Ser Gly Met Met Gly Asn Leu Phe
            100                 105                 110

Val Phe Val Phe Ser Pro Lys Ser Leu Ala Ala Gly Ala Ser Thr Ser
        115                 120                 125

Leu Tyr Gly Leu Phe Ala Ala Ile Ile Val Leu Arg Tyr Ala Thr Arg
    130                 135                 140

Asn Pro Tyr Ile Gln Gln Leu Gly Gln Ser Tyr Leu Thr Leu Phe Val
145                 150                 155                 160

Val Asn Ile Ile Gly Ser Val Leu Ile Pro Gly Ile Ser Leu Ala Gly
                165                 170                 175

His Ile Gly Gly Ala Val Gly Gly Ala Phe Leu Ala Val Ile Phe Pro
            180                 185                 190

Val Arg Gly Glu Lys Arg Met Tyr Asn Thr Ser Gln Arg Leu Gly Ala
        195                 200                 205

Val Val Leu Phe Val Gly Leu Ala Ile Leu Leu Phe Tyr Lys Gly Met
    210                 215                 220

Gly Leu
225
```

<210> 400
<211> 232
<212> PRT
<213> Streptococcus pneumoniae

<400> 400

Met Thr Ala Thr Lys Met Asn Ala Gln Glu Ile Ile Gln Phe Ile Ala
1 5 10 15

Asn Ala Glu Lys Lys Thr Ser Val Lys Val Thr Phe Glu Gly Gln Leu
20 25 30

Ala Thr Ala Val Pro Ser Ser Val Val Lys Leu Gly Asn Val Leu Phe
35 40 45

Gly Asp Trp Lys Asp Val Ala Pro Leu Leu Glu Gly Leu Val Glu Asn
50 55 60

Gln Asp Tyr Val Val Glu Gln Asp Ala Arg Asn Ser Ala Val Pro Leu
65 70 75 80

Leu Asp Lys Arg Ala Ile Asn Ala Arg Ile Glu Pro Gly Ala Ile Ile
85 90 95

Arg Asp Gln Val Glu Ile Gly Asp Asn Ala Val Ile Met Met Gly Ser
100 105 110

Val Ile Asn Ile Gly Ala Glu Ile Gly Ala Gly Thr Met Ile Asp Met
115 120 125

Gly Ala Ile Leu Gly Gly Arg Ala Ile Val Gly Lys Asn Ser His Val
130 135 140

Gly Ala Gly Ala Val Leu Ala Gly Val Ile Glu Pro Ala Ser Ala Glu
145 150 155 160

Pro Val Arg Val Gly Asp Asn Val Leu Ile Gly Ala Asn Ala Val Val
165 170 175

Ile Glu Gly Val Gln Ile Gly Ser Gly Ser Val Val Ala Ala Gly Ala
180 185 190

```
Ile Val Thr Gln Asp Val Pro Glu Asn Val Val Val Ala Gly Val Pro
        195                 200                 205

Ala Arg Ile Ile Lys Glu Ile Asp Ala Gln Thr Gln Gln Lys Thr Ala
    210                 215                 220

Leu Glu Asp Ala Leu Arg Thr Leu
225                 230
```

<210> 401
<211> 361
<212> PRT
<213> Streptococcus pneumoniae

<400> 401

```
Met Trp Gly Val Tyr Gln Leu His Pro Ala Pro Ala Val Gln Val Val
1               5                   10                  15

Val Leu Ala Ile Ala Val Thr Gln Val Leu His Asp Leu Leu Leu Gln
            20                  25                  30

Gly Arg Asp Asp Asn Ser Leu Asn Glu Val Ala Asn Gln Trp Ile Ala
        35                  40                  45

Thr Phe Phe Leu Ser Cys Tyr Asn Lys Gly Met Asn Gln Tyr Gln Lys
    50                  55                  60

Lys Ile Val Asn Gly Lys Ile Tyr Ser Leu Leu Ser Gly Leu Ile Trp
65                  70                  75                  80

Gly Ile Cys Gly Ile Leu Gly Glu Tyr Phe Phe Thr His Tyr Gln Val
                85                  90                  95

Ser Ser Gly Trp Ile Thr Ser Met Arg Leu Thr Leu Ala Gly Ser Leu
            100                 105                 110

Val Leu Ile Trp Ser Ala Ile Gln Leu Lys Ser Gln Val Leu Asp Ile
        115                 120                 125

Trp Arg Asp Lys Lys Asn Tyr Leu Pro Phe Leu Ala Tyr Ala Ile Leu
    130                 135                 140
```

```
Gly Ile Phe Ser Val Gln Tyr Phe Phe Tyr Leu Cys Val Glu Tyr Ser
145                 150                 155                 160

Asn Ala Thr Thr Ala Thr Ile Leu Gln Phe Ile Ser Pro Val Phe Ile
                165                 170                 175

Leu Phe Tyr Asn Arg Leu Val Tyr Gln Lys Arg Ala Ser Lys Ser Ala
            180                 185                 190

Val Phe Tyr Val Leu Val Ala Met Leu Gly Val Cys Leu Met Ala Thr
        195                 200                 205

Lys Gly Asp Leu Ser Gln Leu Ser Met Thr Pro Leu Ala Leu Ile Thr
    210                 215                 220

Gly Leu Leu Ser Ala Met Gly Val Met Phe Asn Val Ile Leu Pro Gln
225                 230                 235                 240

Pro Phe Ala Lys Arg Tyr Gly Phe Val Pro Thr Val Gly Trp Gly Met
                245                 250                 255

Ile Leu Ala Gly Leu Phe Ser Asn Val Leu Ser Pro Val Tyr Gln Leu
            260                 265                 270

Ser Phe Thr Leu Asp Ile Trp Ser Ile Leu Ile Cys Leu Ile Ile Ala
        275                 280                 285

Phe Phe Gly Thr Ala Phe Ala Phe Phe Ile Ser Met Lys Ala Val Ser
    290                 295                 300

Leu Val Ser Pro Leu Val Val Ala Val Ile Ser Ala Ser Glu Pro Leu
305                 310                 315                 320

Ser Ser Ala Leu Leu Ser Val Leu Phe Leu Gly Leu Val Val Asp Trp
                325                 330                 335

Ser Leu Leu Leu Ala Ile Ala Leu Ile Ile Leu Pro Met Ile Phe Leu
            340                 345                 350

Ser Ile Glu Glu Ala Lys Glu Ser Arg
        355                 360
```

<210> 402
<211> 190
<212> PRT
<213> Streptococcus pneumoniae

<400> 402

```
Met Asn Lys Leu Met Lys Phe Ile Ser Val Phe Leu Thr Ser Ile Val
1               5                  10                  15

Leu Ile Val Ser Ala Ile Pro Ser Val Ser Ala Val Tyr Ala Ser Glu
            20                  25                  30

Gln Val Ser Gln Ile Glu Thr Asn Met Glu Leu Gln Pro Val Thr Ser
        35                  40                  45

Leu Thr Glu Glu Gln Ile Asn Thr Leu Ala Asn Glu Ile Gln Ser Phe
    50                  55                  60

His Pro Asp Val Ser Gln Gln Trp Ile Lys Glu Val Ile Asn Arg Gln
65                  70                  75                  80

Leu Gln Gly Asp Tyr Thr Ile Pro Pro Thr Tyr Ser Pro Phe Arg Ala
                85                  90                  95

Val Trp Gln Gly Ile Thr Val Asn Gln Met Gly Ala Leu Leu Asp Thr
            100                 105                 110

Ala Ile Ala Leu Ala Leu Gly Gly Thr Thr Ala Gly Leu Ala Asn Leu
        115                 120                 125

Ile Lys Val Lys Gly Lys His Ala Ala Lys Ser Ala Ile Arg Ser Ala
    130                 135                 140

Ile Ser Arg Tyr Leu Gly Ser Trp Phe Val Asn Asp Val Ala Leu Glu
145                 150                 155                 160

Phe Ala Met Asn Leu Leu Ser Pro Gly Thr Tyr Leu Ala Gln Leu Trp
                165                 170                 175

Asp Lys Asn Asp Ala Ile Pro Asn Asn Gly Arg Ile Asn Phe
            180                 185                 190
```

<210> 403
<211> 435
<212> PRT
<213> Streptococcus pneumoniae

<400> 403

Met Lys Gly Val Asn Met Glu Lys Gln Gln Pro Ser Lys Ala Ala Leu
1 5 10 15

Leu Ser Ile Ile Pro Gly Leu Gly Gln Ile Tyr Asn Lys Gln Lys Ala
20 25 30

Lys Gly Phe Ile Phe Leu Gly Val Thr Ile Val Phe Val Leu Tyr Phe
35 40 45

Leu Ala Leu Ala Thr Pro Glu Leu Ser Asn Leu Ile Thr Leu Gly Asp
50 55 60

Lys Pro Gly Arg Asp Asn Ser Leu Phe Met Leu Ile Arg Gly Ala Phe
65 70 75 80

His Leu Ile Phe Val Ile Val Tyr Val Leu Phe Tyr Phe Ser Asn Ile
85 90 95

Lys Asp Ala His Thr Ile Ala Lys Arg Ile Asn Asn Gly Ile Pro Val
100 105 110

Pro Arg Thr Leu Lys Asp Met Ile Lys Gly Ile Tyr Glu Asn Gly Phe
115 120 125

Pro Tyr Leu Leu Ile Ile Pro Ser Tyr Val Ala Met Thr Phe Ala Ile
130 135 140

Ile Phe Pro Val Ile Val Thr Leu Met Ile Ala Phe Thr Asn Tyr Asp
145 150 155 160

Phe Gln His Leu Pro Pro Asn Lys Leu Leu Asp Trp Val Gly Leu Thr
165 170 175

Asn Phe Thr Asn Ile Trp Ser Leu Ser Thr Phe Arg Ser Ala Phe Gly
180 185 190

```
Ser Val Leu Ser Trp Thr Ile Ile Trp Ala Leu Ala Ala Ser Thr Leu
        195                 200                 205

Gln Ile Val Ile Gly Ile Phe Thr Ala Ile Ile Ala Asn Gln Pro Phe
    210                 215                 220

Ile Lys Gly Lys Arg Ile Phe Gly Val Ile Phe Leu Leu Pro Trp Ala
225                 230                 235                 240

Val Pro Ala Phe Ile Thr Ile Leu Thr Phe Ser Asn Met Phe Asn Asp
                245                 250                 255

Ser Val Gly Ala Ile Asn Thr Gln Val Leu Pro Ile Leu Ala Lys Phe
            260                 265                 270

Leu Pro Phe Leu Asp Gly Ala Leu Ile Pro Trp Lys Thr Asp Pro Thr
        275                 280                 285

Trp Thr Lys Ile Ala Leu Ile Met Met Gln Gly Trp Leu Gly Phe Pro
    290                 295                 300

Tyr Ile Tyr Val Leu Thr Leu Gly Ile Leu Gln Ser Ile Pro Asn Asp
305                 310                 315                 320

Leu Tyr Glu Ala Ala Tyr Ile Asp Gly Ala Asn Ala Trp Gln Lys Phe
                325                 330                 335

Arg Asn Ile Thr Phe Pro Met Ile Leu Ala Val Ala Ala Pro Thr Leu
            340                 345                 350

Ile Ser Gln Tyr Thr Phe Asn Phe Asn Asn Phe Ser Ile Met Tyr Leu
        355                 360                 365

Phe Asn Gly Gly Gly Pro Gly Ser Val Gly Gly Gly Ala Gly Ser Thr
    370                 375                 380

Asp Ile Leu Ile Ser Trp Ile Tyr Arg Leu Thr Thr Gly Thr Ser Pro
385                 390                 395                 400

Gln Tyr Ser Met Ala Ala Ala Val Thr Leu Ile Ile Ser Ile Ile Val
                405                 410                 415
```

```
Ile Ser Ile Ser Met Ile Ala Phe Lys Lys Leu His Ala Phe Asp Met
            420                 425                 430

Glu Asp Val
        435
```

<210> 404
<211> 287
<212> PRT
<213> Streptococcus pneumoniae

<400> 404

```
Met Ile Trp Arg Thr Ser Lys Met Asn Asn Ser Ile Lys Leu Lys Arg
1               5                  10                  15

Arg Leu Thr Gln Ser Leu Thr Tyr Leu Tyr Leu Ile Gly Leu Ser Ile
            20                  25                  30

Val Ile Ile Tyr Pro Leu Leu Ile Thr Ile Met Ser Ala Phe Lys Ala
        35                  40                  45

Gly Asn Val Ser Ala Phe Lys Leu Asp Thr Asn Ile Asp Leu Asn Phe
    50                  55                  60

Asp Asn Phe Lys Gly Leu Phe Thr Glu Thr Leu Tyr Gly Thr Trp Tyr
65                  70                  75                  80

Leu Asn Thr Leu Ile Ile Ala Leu Ile Thr Met Ala Val Gln Thr Ser
                85                  90                  95

Ile Ile Val Leu Ala Gly Tyr Ala Tyr Ser Arg Tyr Asn Phe Leu Ala
            100                 105                 110

Arg Lys Gln Ser Leu Val Phe Phe Leu Ile Ile Gln Met Val Pro Thr
        115                 120                 125

Met Ala Ala Leu Thr Ala Phe Phe Val Met Ala Leu Met Leu Asn Ala
    130                 135                 140

Leu Asn His Asn Trp Phe Leu Ile Phe Leu Tyr Val Gly Gly Gly Ile
145                 150                 155                 160
```

```
Pro Met Asn Ala Trp Leu Met Lys Gly Tyr Phe Asp Thr Val Pro Met
                165                 170                 175

Ser Leu Asp Glu Ser Ala Lys Leu Asp Gly Ala Gly His Phe Arg Arg
            180                 185                 190

Phe Trp Gln Ile Val Leu Pro Leu Val Arg Pro Met Val Ala Val Gln
        195                 200                 205

Ala Leu Trp Ala Phe Met Gly Pro Phe Gly Asp Tyr Ile Leu Ser Ser
    210                 215                 220

Phe Leu Leu Arg Glu Lys Glu Tyr Phe Thr Val Ala Val Gly Leu Gln
225                 230                 235                 240

Thr Phe Val Asn Asn Ala Lys Asn Leu Lys Ile Ala Tyr Phe Ser Ala
                245                 250                 255

Gly Ala Ile Leu Ile Ala Leu Pro Ile Cys Ile Leu Phe Phe Phe Leu
            260                 265                 270

Gln Lys Asn Phe Val Ser Gly Leu Thr Ser Gly Gly Asp Lys Gly
        275                 280                 285
```

<210> 405
<211> 266
<212> PRT
<213> Streptococcus pneumoniae

<400> 405

```
Met Leu Pro Tyr Pro Phe Ser Tyr Phe Ser Ser Ile Trp Gly Val Arg
1               5                   10                  15

Lys Pro Leu Ser Lys Arg Phe Glu Leu Asn Trp Phe Gln Leu Leu Phe
            20                  25                  30

Thr Ser Ile Phe Leu Ile Ser Leu Ser Met Val Pro Ile Ala Ile Gln
        35                  40                  45

Asn Ser Ser Gln Glu Thr Tyr Pro Leu Glu Thr Phe Ile Asp Asn Val
    50                  55                  60
```

```
Tyr Glu Pro Leu Thr Asp Lys Val Val Gln Asp Leu Ser Glu His Ala
65                  70                  75                  80

Thr Ile Val Asp Gly Thr Leu Thr Tyr Thr Gly Thr Ala Ser Gln Ala
                85                  90                  95

Pro Ser Val Val Ile Gly Pro Ser Gln Ile Lys Glu Leu Pro Lys Asp
            100                 105                 110

Leu Gln Leu His Phe Asp Thr Asn Glu Leu Val Ile Ser Lys Glu Ser
        115                 120                 125

Lys Glu Leu Thr Arg Ile Ser Tyr Arg Ala Ile Gln Thr Glu Ser Phe
    130                 135                 140

Lys Ser Lys Asp Ser Leu Thr Gln Ala Ile Ser Lys Asp Trp Tyr Gln
145                 150                 155                 160

Gln Asn Arg Val Tyr Ile Ser Leu Phe Leu Val Leu Gly Ala Ser Phe
                165                 170                 175

Leu Phe Gly Leu Asn Phe Phe Ile Val Ser Leu Gly Ala Ser Phe Leu
            180                 185                 190

Leu Tyr Ile Thr Lys Arg Ser Arg Leu Phe Ser Phe Asn Thr Phe Lys
        195                 200                 205

Glu Cys Tyr His Phe Ile Leu Asn Cys Leu Gly Leu Pro Thr Leu Ile
    210                 215                 220

Thr Leu Ile Leu Gly Leu Phe Gly Gln Asn Met Thr Thr Leu Ile Thr
225                 230                 235                 240

Val Gln Asn Ile Leu Phe Val Leu Tyr Leu Val Thr Ile Phe Tyr Lys
                245                 250                 255

Thr His Phe Arg Asp Pro Asn Tyr His Lys
            260                 265
```

<210> 406

<211> 313
<212> PRT
<213> Streptococcus pneumoniae

<400> 406

Met Lys Gln Thr Lys Arg Ile Lys Arg Trp Arg Tyr Tyr Leu Arg Arg
1 5 10 15

Phe Ala Tyr Gln Ile Lys Ile Leu Arg Val Leu Gln Ser Ile Ser Arg
20 25 30

Glu Lys Tyr Asp Glu Lys Ile Ser Ala Ser Leu Val Tyr Gly Phe Leu
35 40 45

Ser Ala Val Ala Val Asn Phe Phe Phe Gln Pro Gly His Val Tyr Ser
50 55 60

Ser Gly Ala Thr Gly Leu Ala Gln Ile Ile Ser Ala Leu Ser Asn His
65 70 75 80

Trp Phe Gly Phe His Ile Pro Ile Ser Leu Ser Phe Tyr Ala Ile Asn
85 90 95

Phe Pro Leu Met Val Leu Ala Trp Tyr Gln Ile Gly His Lys Phe Thr
100 105 110

Val Phe Thr Phe Ile Thr Val Ser Met Ser Ser Phe Phe Ile Gln Phe
115 120 125

Val Pro Val Ala Thr Leu Thr Glu Asp Pro Ile Ile Asn Ser Leu Phe
130 135 140

Gly Gly Val Val Met Gly Leu Gly Ile Gly Phe Ala Leu Arg Asn Asn
145 150 155 160

Ile Ser Ser Gly Gly Thr Asp Ile Val Ser Leu Thr Ile Arg Lys Lys
165 170 175

Thr Gly Lys Asn Val Gly Ser Ile Ser Phe Leu Val Asn Gly Thr Ile
180 185 190

Met Leu Ile Ala Gly Leu Thr Phe Gly Trp Lys Tyr Ala Leu Tyr Ser

```
        195                 200                 205

Met Ile Thr Ile Phe Val Ser Ser Arg Val Thr Asp Ala Val Phe Thr
    210                 215                 220

Lys Gln Lys Arg Met Gln Ala Met Ile Val Thr Asn His Pro Glu Lys
225                 230                 235                 240

Val Ile Glu Lys Ile His Lys Lys Leu His Arg Gly Ala Thr Met Ile
                245                 250                 255

His Asp Ala Glu Gly Thr Tyr Asn His Glu Arg Lys Ala Val Leu Ile
            260                 265                 270

Thr Val Ile Thr Arg Ala Glu Phe Asn Glu Phe Lys Gln Ile Met Thr
        275                 280                 285

Gln Val Asp Pro Ser Ser Phe Val Ser Val Ser Glu Asn Val His Ile
    290                 295                 300

Leu Gly Arg Phe Val Glu Ile Asp Asn
305                 310
```

<210> 407
<211> 76
<212> PRT
<213> Streptococcus pneumoniae

<400> 407

```
Met Lys Arg Val Ile Leu Leu Ala Val Ile Gln Ala Val Val Leu Phe
1               5                   10                  15

Phe Ile Ile Gly Ala Leu Ala Tyr Ala Phe Lys Gly Asp Phe Phe Tyr
            20                  25                  30

Asn Tyr Leu Ala Val Val Phe Ala Pro Ile Ala Gly Val Leu Arg Phe
        35                  40                  45

Gly Thr Ala Tyr Ile Thr Glu Ile Val Leu Pro Arg Lys Ala Ala Glu
    50                  55                  60

Ile Ala Glu Lys Arg Lys Ala Gly Lys Asn Ser Lys
```

65 70 75

<210> 408
<211> 213
<212> PRT
<213> Streptococcus pneumoniae

<400> 408

Met Lys Leu Leu Lys Asn Leu Gly Trp Ile Leu Leu Ala Leu Leu Ser
1 5 10 15

Phe Leu Phe Ile Tyr Gly Phe Ile Gln Gly Leu Ala Thr Ala Ser Leu
20 25 30

Ala Leu Gly Ala Ser Pro Tyr Ala Val Thr Leu Leu Tyr Val Ala Leu
35 40 45

Ala Gly Val Tyr Val Tyr Gly Ile Tyr Lys Trp Tyr Gln Lys Ala Pro
50 55 60

Val His Ile Glu Lys Ser Gly Phe Asn Arg Phe Ile Trp Leu Pro Val
65 70 75 80

Leu Val Trp Phe Leu Ser Leu Val Val Gln Phe Phe Leu Pro Asp Asp
85 90 95

Pro Ser Val Asn Gln Gln Ile Ala Thr Asp Leu Thr Leu Ser Gln Pro
100 105 110

Leu Phe Ser Phe Phe Ala Val Val Ile Phe Ala Pro Leu Thr Glu Glu
115 120 125

Ile Val Phe Arg Gly Met Leu Ala Arg Tyr Leu Phe Pro Lys Gln Asp
130 135 140

Asn Ser Lys Arg Thr Leu Ile Phe Leu Leu Val Ser Ser Leu Leu Phe
145 150 155 160

Ala Leu Ile His Phe Pro Gly Asp Val Gln Gln Phe Phe Val Tyr Phe
165 170 175

Ser Leu Gly Phe Ser Leu Gly Leu Ala Tyr Ile Ser Arg Lys Gly Leu

180 185 190

Val Tyr Ser Ile Ser Leu His Ala Leu Asn Asn Leu Val Gly Phe Leu
195 200 205

Met Ile Leu Met Leu
210

<210> 409
<211> 226
<212> PRT
<213> Streptococcus pneumoniae

<400> 409

Met Gly Met Phe Val Gly Met Phe Lys Ala Arg Val Glu Ser His Glu
1 5 10 15

Ile Ile Leu Asp Val Lys Ala Leu Met Pro Trp Ile Ser Ala Ile Cys
20 25 30

Leu Leu Ile Gly Phe Ile Ser Met Phe Leu Thr Phe Asn Phe Leu Lys
35 40 45

Lys Ser Arg Lys Phe His Ser Leu Tyr Gln Glu Glu Met Asp Asp Asp
50 55 60

Leu Asn Glu Thr Tyr Tyr Val Gln Met Tyr Arg Asn Leu Glu Phe Gly
65 70 75 80

Thr Ile Ala Phe Asn Ile Thr Gly Val Ala Ile Pro Leu Ala Ile Phe
85 90 95

Ile Ser Leu Ser Glu Val Ile Ile Leu His Thr Asn Pro Gln Thr Phe
100 105 110

Phe Leu Ser Phe Leu Leu Phe Val Val Phe Leu Val Ala Gln Lys Ser
115 120 125

Leu Phe Lys Thr Ile Ala Ile Val Arg Gln Phe Asp Leu Glu Phe Phe
130 135 140

Ala Thr Pro Lys Asp Val Leu Asn Tyr Ile Asn Ser Tyr Asp Glu Gly

145 150 155 160

Glu Arg Gln Ala Asn Leu Glu Gln Ser Phe Arg Ile Leu Phe Gln Leu
165 170 175

His Gln Tyr Val Leu Pro Ala Leu Tyr Ile Phe Leu Ile Ile Ile Ser
180 185 190

Phe Leu Thr Gly Glu Ile Gln Leu Leu Ala Phe Leu Leu Val Gly Ala
195 200 205

Ile His Val Tyr Ile Asn Val Met Gln Leu Pro Met Val Lys Arg Tyr
210 215 220

Phe Lys
225

<210> 410
<211> 621
<212> PRT
<213> Streptococcus pneumoniae

<400> 410

Met Lys Lys Thr Thr Ile Leu Ser Leu Thr Thr Ala Ala Val Ile Leu
1 5 10 15

Ala Ala Tyr Val Pro Asn Glu Pro Ile Leu Ala Asp Thr Pro Ser Ser
20 25 30

Glu Val Ile Lys Glu Thr Lys Val Gly Ser Ile Ile Gln Gln Asn Asn
35 40 45

Ile Lys Tyr Lys Val Leu Thr Val Glu Gly Asn Ile Gly Thr Val Gln
50 55 60

Val Gly Asn Gly Val Thr Pro Val Glu Phe Glu Ala Gly Gln Asp Gly
65 70 75 80

Lys Pro Phe Thr Ile Pro Thr Lys Ile Thr Val Gly Asp Lys Val Phe
85 90 95

Thr Val Thr Glu Val Ala Ser Gln Ala Phe Ser Tyr Tyr Pro Asp Glu

```
            100                 105                 110

Thr Gly Arg Ile Val Tyr Tyr Pro Ser Ser Ile Thr Ile Pro Ser Ser
        115                 120                 125

Ile Lys Lys Ile Gln Lys Lys Gly Phe His Gly Ser Lys Ala Lys Thr
    130                 135                 140

Ile Ile Phe Asp Lys Gly Ser Gln Leu Glu Lys Ile Glu Asp Arg Ala
145                 150                 155                 160

Phe Asp Phe Ser Glu Leu Glu Glu Ile Glu Leu Pro Ala Ser Leu Glu
                165                 170                 175

Tyr Ile Gly Thr Ser Ala Phe Ser Phe Ser Gln Lys Leu Lys Lys Leu
            180                 185                 190

Thr Phe Ser Ser Ser Ser Lys Leu Glu Leu Ile Ser His Glu Ala Phe
        195                 200                 205

Ala Asn Leu Ser Asn Leu Glu Lys Leu Thr Leu Pro Lys Ser Val Lys
    210                 215                 220

Thr Leu Gly Ser Asn Leu Phe Arg Leu Thr Thr Ser Leu Lys His Val
225                 230                 235                 240

Asp Val Glu Glu Gly Asn Glu Ser Phe Ala Ser Val Asp Gly Val Leu
                245                 250                 255

Phe Ser Lys Asp Lys Thr Gln Leu Ile Tyr Tyr Pro Ser Gln Lys Asn
            260                 265                 270

Asp Glu Ser Tyr Lys Thr Pro Lys Glu Thr Lys Glu Leu Ala Ser Tyr
        275                 280                 285

Ser Phe Asn Lys Asn Ser Tyr Leu Lys Lys Leu Glu Leu Asn Glu Gly
    290                 295                 300

Leu Glu Lys Ile Gly Thr Phe Ala Phe Ala Asp Ala Ile Lys Leu Glu
305                 310                 315                 320
```

```
Glu Ile Ser Leu Pro Asn Ser Leu Glu Thr Ile Glu Arg Leu Ala Phe
                325                 330                 335

Tyr Gly Asn Leu Glu Leu Lys Glu Leu Ile Leu Pro Asp Asn Val Lys
            340                 345                 350

Asn Phe Gly Lys His Val Met Asn Gly Leu Pro Lys Leu Lys Ser Leu
        355                 360                 365

Thr Ile Gly Asn Asn Ile Asn Ser Leu Pro Ser Phe Phe Leu Ser Gly
    370                 375                 380

Val Leu Asp Ser Leu Lys Glu Ile His Ile Lys Asn Lys Ser Thr Glu
385                 390                 395                 400

Phe Ser Val Lys Lys Asp Thr Phe Ala Ile Pro Glu Thr Val Lys Phe
                405                 410                 415

Tyr Val Thr Ser Glu His Ile Lys Asp Val Leu Lys Ser Asn Leu Ser
            420                 425                 430

Thr Ser Asn Asp Ile Ile Val Glu Lys Val Asp Asn Ile Lys Gln Glu
        435                 440                 445

Thr Asp Val Ala Lys Pro Lys Lys Asn Ser Asn Gln Gly Val Val Gly
    450                 455                 460

Trp Val Lys Asp Lys Gly Leu Trp Tyr Tyr Leu Asn Glu Ser Gly Ser
465                 470                 475                 480

Met Ala Thr Gly Trp Val Lys Asp Lys Gly Leu Trp Tyr Tyr Leu Asn
                485                 490                 495

Glu Ser Gly Ser Met Ala Thr Gly Trp Val Lys Asp Lys Gly Leu Trp
            500                 505                 510

Tyr Tyr Leu Asn Glu Ser Gly Ser Met Ala Thr Gly Trp Val Lys Asp
        515                 520                 525

Lys Gly Leu Trp Tyr Tyr Leu Asn Glu Ser Gly Ser Met Ala Thr Gly
    530                 535                 540
```

```
Trp Val Lys Asp Lys Gly Leu Trp Tyr Tyr Leu Asn Glu Ser Gly Ser
545                 550                 555                 560

Met Ala Thr Gly Trp Val Lys Asp Lys Gly Leu Trp Tyr Tyr Leu Asn
                565                 570                 575

Glu Ser Gly Ser Met Ala Thr Gly Trp Val Thr Val Ser Gly Lys Trp
            580                 585                 590

Tyr Tyr Thr Tyr Asn Ser Gly Asp Leu Leu Val Asn Thr Thr Thr Pro
        595                 600                 605

Asp Gly Tyr Arg Val Asn Ala Asn Gly Glu Trp Val Gly
    610                 615                 620
```

<210> 411
<211> 383
<212> PRT
<213> Streptococcus pneumoniae

<400> 411

```
Met Ala Ile Phe Tyr Val Pro Ala Val Asn Leu Ile Gly Lys Gly Val
1               5                   10                  15

Val Asn Glu Val Gly Pro Tyr Ile Lys Glu Leu Gly Tyr Lys Lys Ala
            20                  25                  30

Leu Leu Val Thr Asp Lys Tyr Ile Glu Gly Ser Asp Ile Leu Pro Lys
        35                  40                  45

Thr Leu Lys Pro Leu Asp Thr Glu Gly Ile Glu Tyr Val Ile Phe Ser
    50                  55                  60

Asp Val Glu Pro Asn Pro Thr Cys Lys Asn Val Thr Asp Gly Val Ala
65                  70                  75                  80

Ala Leu Gln Glu His Gly Cys Asp Phe Ile Ile Ser Leu Gly Gly Gly
                85                  90                  95

Ser Pro Gln Asp Ala Ala Ser Cys Ile Ser Ile Met Ala Thr Asn Gly
            100                 105                 110
```

```
Gly Lys Pro Gln Asp Tyr Glu Gly Leu His Lys Ser Ala Lys Lys Gly
        115                 120                 125

Leu Pro Val Val Ala Ile Asn Thr Thr Ala Gly Thr Ser Ala Glu Ile
    130                 135                 140

Thr Ile Asn Tyr Val Ile Thr Asp Glu Glu Arg Lys Val Lys Met Val
145                 150                 155                 160

Met Val Asp Lys Asn Ser Leu Ala Leu Ile Ser Val Asn Asp Pro Glu
                165                 170                 175

Leu Met Leu Ser Lys Pro Lys Gly Leu Thr Ala Ala Thr Gly Met Asp
            180                 185                 190

Ala Leu Thr His Ala Val Glu Ala Leu Val Thr Pro Gly Ala Tyr Asp
        195                 200                 205

Val Thr Lys Lys Leu Ser Ile Gly Ala Ile Glu Leu Ile Lys Glu Tyr
    210                 215                 220

Leu Pro Arg Ala Val Glu Asn Gly His Asp Ile Glu Ala Arg Glu Gly
225                 230                 235                 240

Met Val Asn Ala Ile Phe Leu Gly Gly Met Ser Phe Asn Asn Ala Gly
                245                 250                 255

Leu Gly Tyr Val His Ser Met Ala His Gln Leu Gly Ala Val Tyr Asn
            260                 265                 270

Leu Pro His Gly Val Cys Cys Ala Met Leu Leu Pro Val Ile Glu Arg
        275                 280                 285

Glu Asn Ala Lys Arg Val Pro Glu Ala Phe Arg Asn Val Ala Lys Ala
    290                 295                 300

Leu Gly Leu His Val Glu Gly Lys Ser Asp Gln Glu Cys Ala Asp Tyr
305                 310                 315                 320

Ala Ile Ala Glu Ile Glu Lys Leu Ser Glu Thr Val Gly Ile Pro Lys
                325                 330                 335
```

```
Lys Leu Thr Glu Leu Gly Ile Glu Glu Lys Asp Phe Asp Phe Glu Tyr
            340                 345                 350

Leu Ser Lys Asn Ala Leu Ile Asp Ala Cys Ala Pro Gly Asn Pro Phe
        355                 360                 365

Met Pro Thr Leu Glu Glu Thr Ile Ala Phe Tyr Lys Glu Leu Phe
    370                 375                 380
```

<210> 412
<211> 257
<212> PRT
<213> Streptococcus pneumoniae

<400> 412

```
Met Ile Lys Asp Glu Arg Val Leu Glu Leu Ile Glu Ile Ile Lys Lys
1               5                   10                  15

Lys Lys Arg Ile Ala Val Lys Glu Leu Ala Glu Ile Thr Phe Ser Ser
            20                  25                  30

Thr Ser Thr Leu Arg Arg Asp Leu Ile Phe Leu Glu Asn Gln Gly Leu
        35                  40                  45

Ile Lys Arg Lys His Gly Tyr Val Thr Leu Ser Ser Met Asn Thr Ile
    50                  55                  60

Glu Leu Ser His Gln Ile Arg Glu Gly Glu Ser Thr Arg Gln Lys Arg
65                  70                  75                  80

Leu Ile Ala Ser Leu Ala Lys Asp Phe Ile Arg Ser Gly Met Cys Ile
                85                  90                  95

Tyr Leu Asp Ser Ser Thr Thr Val Tyr Glu Leu Cys Pro Tyr Leu Ser
            100                 105                 110

Glu Leu Asp Asn Leu Ile Ile Phe Thr Asn Gly Leu His Thr Ala Gln
        115                 120                 125

Thr Leu Ser Glu Thr Val Lys Asp Ser Ser Lys Ile Phe Ile Thr Ser
    130                 135                 140
```

```
Gly Glu Val Lys His Gln Ser Cys Ser Val Val Asn Tyr Asp Lys Glu
145                 150                 155                 160

Asn Ser Leu Leu Asp His Phe Asn Ile Asp Leu Ala Phe Cys Ser Ala
                165                 170                 175

Arg Gly Ile Asp Asp Gln Tyr Val Tyr Glu Ala Ser Leu Ser Gln Ala
            180                 185                 190

Ile Ser Lys Lys Asn Ile Ile Asp Lys Ala His Glu Thr Ile Leu Leu
        195                 200                 205

Ile Asp Ser Ser Lys Phe Tyr Lys Thr Gly Phe Phe Lys Ile Asn Pro
    210                 215                 220

Leu Ser Lys Tyr Thr Thr Phe Ile Ser Asp Thr Val Pro Asp Gln Lys
225                 230                 235                 240

Leu Leu Asp Ala Val Glu Leu Phe Asp Gly Glu Trp Val Ser Asp Ile
                245                 250                 255

Gln
```

<210> 413
<211> 268
<212> PRT
<213> Streptococcus pneumoniae

<400> 413

```
Met Leu Ser Leu Leu Ser Tyr Asp Phe Ile Gln Arg Ala Phe Leu Ala
1               5                   10                  15

Val Ile Ala Met Ser Leu Phe Ser Pro Val Leu Gly Thr Phe Leu Ile
            20                  25                  30

Leu Arg Arg Gln Ser Leu Met Ser Asp Thr Leu Ser His Val Ser Leu
        35                  40                  45

Ser Gly Val Ala Phe Gly Leu Val Leu Gly Ile Ser Pro Thr Val Ser
    50                  55                  60
```

```
Thr Ile Ala Ile Val Leu Ile Ala Ala Val Phe Leu Glu Tyr Leu Arg
65                  70                  75                  80

Thr Val Tyr Lys Ser Phe Met Glu Ile Gly Thr Ala Ile Leu Met Ser
                85                  90                  95

Thr Gly Leu Ala Val Ser Leu Ile Val Met Ser Lys Gly Lys Ser Ser
            100                 105                 110

Ser Ser Met Ser Leu Asp Gln Tyr Leu Phe Gly Ser Ile Val Thr Ile
        115                 120                 125

Ser Glu Glu Gln Val Ile Ser Leu Phe Val Ile Ala Ala Val Val Leu
    130                 135                 140

Ile Leu Thr Phe Leu Phe Leu Arg Pro Met Tyr Ile Leu Thr Phe Asp
145                 150                 155                 160

Glu Asp Thr Ala Phe Val Asp Gly Leu Pro Val Arg Thr Met Ser Ile
                165                 170                 175

Leu Phe Asn Met Val Thr Gly Val Ala Ile Ala Leu Met Ile Pro Ala
            180                 185                 190

Ala Gly Ala Leu Leu Val Ser Thr Ile Met Val Leu Pro Ala Ser Ile
        195                 200                 205

Ala Leu Arg Leu Gly Lys Asn Phe Lys Ser Val Met Leu Leu Ala Ser
    210                 215                 220

Ala Ile Gly Phe Leu Gly Met Val Ala Gly Leu Tyr Ile Ser Tyr Tyr
225                 230                 235                 240

Ala Glu Thr Pro Ala Ser Ala Ser Ile Thr Ile Ile Phe Val Thr Val
                245                 250                 255

Phe Ile Leu Ile Ser Leu Val Arg Arg Phe Ile Lys
            260                 265
```

<210> 414

<211> 234
<212> PRT
<213> Streptococcus pneumoniae

<400> 414

Met Arg Tyr Ile Thr Val Glu Asp Leu Ser Phe Tyr Tyr Asp Lys Glu
1 5 10 15

Pro Val Leu Glu His Ile Asn Tyr Cys Val Asp Ser Gly Glu Phe Val
20 25 30

Thr Leu Thr Gly Glu Asn Gly Ala Ala Lys Thr Thr Leu Ile Lys Ala
35 40 45

Ser Leu Gly Ile Leu Gln Pro Arg Ile Gly Lys Val Ala Ile Ser Lys
50 55 60

Thr Asn Thr Gln Gly Lys Lys Leu Arg Ile Ala Tyr Leu Pro Gln Gln
65 70 75 80

Ile Ala Ser Phe Asn Ala Gly Phe Pro Ser Thr Val Tyr Glu Phe Val
85 90 95

Lys Ser Gly Arg Tyr Pro Arg Lys Gly Trp Phe Arg Arg Leu Asn Ala
100 105 110

His Asp Glu Glu His Ile Lys Ala Ser Leu Asp Ser Val Gly Met Trp
115 120 125

Glu His Arg Asp Lys Arg Leu Gly Ser Leu Ser Gly Gly Gln Lys Gln
130 135 140

Arg Ala Val Ile Ala Arg Met Phe Ala Ser Asp Pro Asp Val Phe Ile
145 150 155 160

Leu Asp Glu Pro Thr Thr Gly Met Asp Ala Gly Ser Lys Asn Glu Phe
165 170 175

Tyr Glu Leu Met His His Ser Ala His His His Gly Lys Ala Val Leu
180 185 190

Met Ile Thr His Asp Pro Glu Glu Val Lys Asp Tyr Ala Asp Arg Asn

195 200 205

Ile His Leu Val Arg Asn Gln Asp Ser Pro Trp Arg Cys Phe Asn Val
210 215 220

His Glu Asn Gly Gln Glu Val Gly His Ala
225 230

<210> 415
<211> 516
<212> PRT
<213> Streptococcus pneumoniae

<400> 415

Met Ser Asn Lys Pro Ile Ala Asp Met Ile Glu Thr Ile Glu His Phe
1 5 10 15

Ala Gln Thr Gln Pro Ser Tyr Pro Val Tyr Asn Val Leu Gly Gln Glu
20 25 30

His Thr Tyr Gly Asp Leu Lys Ala Asp Ser Asp Ser Leu Ala Ala Val
35 40 45

Ile Asp Gln Leu Gly Leu Pro Glu Lys Ser Pro Val Val Val Phe Gly
50 55 60

Gly Gln Glu Tyr Glu Met Leu Ala Thr Phe Val Ala Leu Thr Lys Ser
65 70 75 80

Gly His Ala Tyr Ile Pro Ile Asp Ser His Ser Ala Leu Glu Arg Val
85 90 95

Ser Ala Ile Leu Glu Val Ala Glu Pro Ser Leu Ile Ile Ala Ile Ser
100 105 110

Ala Phe Pro Leu Glu Gln Val Ser Thr Pro Met Ile Asn Leu Ala Gln
115 120 125

Val Gln Glu Ala Phe Ala Gln Gly Asn Asn Tyr Glu Ile Thr His Pro
130 135 140

Val Lys Gly Asp Asp Asn Tyr Tyr Ile Ile Phe Thr Ser Gly Thr Thr

```
145                 150                 155                 160

Gly Lys Pro Lys Gly Val Gln Ile Ser His Asp Asn Leu Leu Ser Phe
                165                 170                 175

Thr Asn Trp Met Ile Thr Asp Lys Glu Phe Ala Thr Pro Ser Arg Pro
            180                 185                 190

Gln Met Leu Ala Gln Pro Pro Tyr Ser Phe Asp Leu Ser Val Met Tyr
        195                 200                 205

Trp Ala Pro Thr Leu Ala Leu Gly Gly Thr Leu Phe Thr Leu Pro Ser
    210                 215                 220

Val Ile Thr Gln Asp Phe Lys Gln Leu Phe Ala Ala Ile Phe Ser Leu
225                 230                 235                 240

Pro Ile Ala Ile Trp Thr Ser Thr Pro Ser Phe Ala Asp Met Ala Met
                245                 250                 255

Leu Ser Glu Tyr Phe Asn Ser Glu Lys Met Pro Gly Ile Thr His Phe
            260                 265                 270

Tyr Phe Asp Gly Glu Glu Leu Thr Val Lys Thr Ala Gln Lys Leu Arg
        275                 280                 285

Glu Arg Phe Pro Asn Ala Arg Ile Ile Asn Ala Tyr Gly Pro Thr Glu
    290                 295                 300

Ala Thr Val Ala Leu Ser Ala Val Ala Val Thr Asp Glu Met Leu Ala
305                 310                 315                 320

Thr Leu Lys Arg Leu Pro Ile Gly Tyr Thr Lys Ala Asp Ser Pro Thr
                325                 330                 335

Phe Ile Ile Asp Glu Glu Gly Asn Lys Leu Pro Asn Gly Glu Gln Gly
            340                 345                 350

Glu Ile Ile Val Ser Gly Pro Ala Val Ser Lys Gly Tyr Met Asn Asn
        355                 360                 365
```

```
Pro Glu Lys Thr Ala Glu Ala Phe Phe Glu Phe Glu Asp Leu Pro Ala
    370                 375                 380

Tyr His Thr Gly Asp Val Gly Thr Met Thr Asp Glu Gly Leu Leu Leu
385                 390                 395                 400

Tyr Gly Gly Arg Met Asp Phe Gln Ile Lys Phe Asn Gly Tyr Arg Ile
                405                 410                 415

Glu Leu Glu Asp Val Ser Gln Asn Leu Asn Lys Ser Arg Phe Ile Glu
            420                 425                 430

Ser Ala Val Ala Val Pro Arg Tyr Asn Lys Asp His Lys Val Gln Asn
        435                 440                 445

Leu Leu Ala Tyr Val Ile Leu Lys Asp Gly Val Arg Glu Gln Phe Glu
    450                 455                 460

Arg Asp Ile Asp Ile Thr Lys Ala Ile Lys Glu Asp Leu Thr Asp Ile
465                 470                 475                 480

Met Met Ser Tyr Met Met Pro Ser Lys Phe Leu Tyr Arg Asp Ser Leu
                485                 490                 495

Pro Leu Thr Pro Asn Gly Lys Ile Asp Ile Lys Gly Leu Ile Asn Glu
            500                 505                 510

Val Asn Lys Arg
        515
```

<210> 416
<211> 131
<212> PRT
<213> Streptococcus pneumoniae

<400> 416

```
Met Met Ser Leu Val His Asn Ile Ile Glu Asp Gly Asp Thr Glu Ser
1               5                   10                  15

Leu Ile Arg Lys Tyr Leu His Ser Gly Val Ile Ile Asn Gly Gln Arg
            20                  25                  30
```

```
Tyr Lys Thr Leu Val Gly Thr Pro Gln Gly Gly Asn Leu Ser Pro Leu
        35                  40                  45

Leu Ser Asn Ile Met Leu Asn Glu Leu Asp Lys Glu Leu Glu Lys Arg
    50                  55                  60

Gly Leu Arg Phe Val Arg Tyr Ala Asp Asp Cys Val Ile Thr Val Gly
65                  70                  75                  80

Ser Glu Ala Ala Ser Lys Arg Val Met Tyr Ser Val Ser Arg Phe Ile
                85                  90                  95

Glu Lys Arg Leu Gly Leu Lys Val Asn Met Thr Lys Arg Val Glu Ile
            100                 105                 110

Ser Arg Phe Trp Val Leu Glu Ile Ile Arg Trp Leu Glu Lys Pro Ser
        115                 120                 125

Thr Ser Arg
    130
```

<210> 417
<211> 137
<212> PRT
<213> Streptococcus pneumoniae

<400> 417

```
Met Ser Lys Leu Leu Asp Lys Ile Leu Ser Arg Glu Asn Met Leu Glu
1               5                   10                  15

Ala Tyr Asn Gln Val Lys Ser Asn Lys Gly Ser Ala Gly Ile Asp Gly
            20                  25                  30

Met Thr Ile Glu Glu Met Asp Asn Tyr Leu Arg Gln Asn Trp Arg Leu
        35                  40                  45

Thr Lys Glu Leu Ile Lys Gln Arg Lys Tyr Lys Pro Gln Pro Val Leu
    50                  55                  60

Arg Val Glu Ile Pro Lys Pro Asp Gly Gly Ile Arg Gln Leu Gly Ile
65                  70                  75                  80
```

```
Pro Thr Val Met Asp Arg Met Ile Gln Gln Ala Ile Val Gln Val Met
                85                  90                  95

Ser Pro Ile Cys Glu Pro His Phe Ser Asp Thr Ser Tyr Gly Phe Arg
            100                 105                 110

Pro Asn Arg Ser Cys Glu Lys Ala Ile Met Lys Leu Leu Glu Tyr Leu
        115                 120                 125

Asn Asp Gly Tyr Glu Trp Ile Val Asp
    130                 135

<210>  418
<211>  164
<212>  PRT
<213>  Streptococcus pneumoniae

<400>  418

Met Arg Gln Leu Lys Arg Val Gly Val Phe Leu Leu Leu Pro Phe Phe
1               5                   10                  15

Val Leu Ile Asp Ala His Ile Ser Gln Leu Leu Gly Ser Phe Phe Pro
            20                  25                  30

His Val His Leu Ala Ser His Phe Leu Phe Leu Phe Leu Leu Phe Glu
        35                  40                  45

Thr Ile Glu Val Ser Glu Tyr Leu Tyr Leu Val Tyr Cys Phe Val Ile
    50                  55                  60

Gly Leu Val Tyr Asp Val Tyr Phe Phe His Leu Ile Gly Ile Thr Thr
65                  70                  75                  80

Leu Leu Phe Ile Leu Leu Gly Ala Phe Leu His Lys Leu Asn Ser Val
                85                  90                  95

Ile Leu Leu Asn Arg Trp Thr Arg Met Leu Ala Met Ile Val Leu Thr
            100                 105                 110

Phe Leu Phe Glu Met Gly Ser Tyr Leu Leu Ala Phe Met Val Gly Leu
        115                 120                 125
```

```
Thr Val Asp Ser Met Ser Ile Phe Ile Val Tyr Ser Leu Val Pro Thr
    130                 135                 140

Met Ile Leu Asn Phe Leu Trp Ile Thr Val Phe Gln Phe Ile Phe Glu
145                 150                 155                 160

Lys Tyr Tyr Leu
```

<210> 419
<211> 427
<212> PRT
<213> Streptococcus pneumoniae

<400> 419

```
Met Thr Lys Val Val Phe Glu Glu Lys Tyr Tyr Pro Ala Val Lys Glu
1               5                   10                  15

Met Val Tyr Arg Thr Arg Leu Ala Asn Gly Leu Thr Val Ala Leu Leu
            20                  25                  30

Pro Lys Lys Glu Phe Lys Glu Val Tyr Gly Ser Val Thr Val Gln Phe
        35                  40                  45

Gly Ser Val Asp Thr Phe Val Thr Glu Val Asp Gly Asp Val Lys Gln
    50                  55                  60

Tyr Pro Gly Gly Ile Ala His Phe Leu Glu His Lys Leu Phe Glu Arg
65                  70                  75                  80

Glu Asp Ser Ser Asp Leu Met Ser Ala Phe Thr Ser Leu Gly Ala Asp
                85                  90                  95

Ser Asn Ala Phe Thr Ser Phe Thr Lys Thr Asn Tyr Leu Phe Ser Ala
            100                 105                 110

Thr Asp Tyr Phe Leu Glu Asn Leu Asp Leu Leu Asp Glu Leu Val Thr
        115                 120                 125

Ser Ala His Phe Thr Glu Ala Ser Ile Leu Thr Glu Gln Asp Ile Ile
    130                 135                 140
```

```
Gln Gln Glu Arg Glu Met Tyr Gln Asp Asp Pro Asp Ser Cys Leu Phe
145                 150                 155                 160

Phe Ser Thr Leu Ala Asn Leu Tyr Pro Gly Thr Pro Leu Ala Thr Asp
                165                 170                 175

Ile Val Gly Ser Glu Glu Ser Ile Ser Gln Ile Asn Leu Thr Asn Leu
            180                 185                 190

Gln Glu Asn Phe Thr Lys Phe Tyr Lys Pro Val Asn Met Ser Leu Phe
        195                 200                 205

Leu Val Gly Asn Phe Asp Val Glu Arg Val Gln Asp Tyr Phe Glu Ser
    210                 215                 220

Lys Glu Leu Lys Asp Ser Asp Phe Gln Glu Val Ala Arg Glu Lys Leu
225                 230                 235                 240

Phe Leu Gln Pro Val Lys Pro Thr Asp Ser Met Arg Met Glu Val Ser
                245                 250                 255

Ser Pro Lys Leu Ala Ile Gly Val Arg Gly Lys Arg Glu Val Ser Glu
            260                 265                 270

Ala Asp Cys Tyr Arg His His Ile Leu Leu Lys Leu Leu Phe Ala Met
        275                 280                 285

Met Phe Gly Trp Thr Ser Asp Arg Phe Gln Lys Cys Tyr Glu Ser Gly
    290                 295                 300

Lys Ile Asp Ala Ser Leu Ser Leu Glu Val Glu Ile Thr Ser Arg Phe
305                 310                 315                 320

His Phe Val Met Leu Thr Met Asp Thr Lys Glu Pro Val Ala Leu Ser
                325                 330                 335

His Gln Phe Arg Lys Ala Ile Arg Asn Phe Thr Lys Asp Leu Asp Ile
            340                 345                 350

Thr Glu Glu His Leu Asp Ile Ile Lys Arg Glu Met Phe Gly Glu Phe
        355                 360                 365
```

```
Phe Ser Ser Met Asn Ser Leu Glu Phe Ile Ala Thr Gln Tyr Asp Ala
    370                 375                 380

Phe Glu Asn Gly Glu Ile Ile Phe Asp Leu Pro Lys Ile Leu Gln Glu
385                 390                 395                 400

Ile Thr Leu Glu Asp Val Leu Asp Ala Gly His His Leu Ile Asp Asp
                405                 410                 415

Gly Asp Ile Val Asp Phe Thr Ile Phe Pro Ser
            420                 425


<210>  420
<211>  540
<212>  PRT
<213>  Streptococcus pneumoniae

<400>  420

Met Leu Thr Val Ser Asp Val Ser Leu Arg Phe Ser Asp Arg Lys Leu
1               5                   10                  15

Phe Asp Asp Val Asn Ile Lys Phe Thr Glu Gly Asn Thr Tyr Gly Leu
            20                  25                  30

Ile Gly Ala Asn Gly Ala Gly Lys Ser Thr Phe Leu Lys Ile Leu Ala
        35                  40                  45

Gly Asp Ile Glu Pro Thr Thr Gly His Ile Ser Leu Gly Pro Asp Glu
    50                  55                  60

Arg Leu Ser Val Leu Arg Gln Asn His Phe Asp Tyr Glu Asp Glu Arg
65                  70                  75                  80

Ala Ile Asp Val Val Ile Met Gly Asn Glu Lys Leu Tyr Ser Ile Met
                85                  90                  95

Lys Glu Lys Asp Ala Ile Tyr Met Lys Glu Asp Phe Ser Asp Glu Asp
            100                 105                 110

Gly Val Arg Ala Ala Glu Leu Glu Gly Glu Phe Ala Glu Leu Gly Gly
        115                 120                 125
```

```
Trp Glu Ala Glu Ser Glu Ala Ser Gln Leu Leu Gln Asn Leu Asn Ile
    130                 135                 140

Pro Glu Glu Leu His Tyr Gln Asn Met Ser Glu Leu Ala Asn Gly Glu
145                 150                 155                 160

Lys Val Lys Val Leu Leu Ala Lys Ala Leu Phe Gly Lys Pro Asp Val
                165                 170                 175

Leu Leu Leu Asp Glu Pro Thr Asn Gly Leu Asp Ile Gln Ser Ile Thr
            180                 185                 190

Trp Leu Glu Asp Phe Leu Ile Asp Phe Asp Asn Thr Val Ile Val Val
        195                 200                 205

Ser His Asp Arg His Phe Leu Asn Lys Val Cys Thr His Met Ala Asp
    210                 215                 220

Leu Asp Phe Gly Lys Ile Lys Leu Tyr Val Gly Asn Tyr Asp Phe Trp
225                 230                 235                 240

Lys Glu Ser Ser Glu Leu Ala Ala Lys Leu Leu Ala Asp Arg Asn Ala
                245                 250                 255

Lys Ala Glu Glu Lys Ile Lys Gln Leu Gln Glu Phe Val Ala Arg Phe
            260                 265                 270

Ser Ala Asn Ala Ser Lys Ser Arg Gln Ala Thr Ser Arg Lys Lys Met
        275                 280                 285

Leu Asp Lys Ile Glu Leu Glu Glu Ile Val Pro Ser Ser Arg Lys Tyr
    290                 295                 300

Pro Phe Ile Asn Phe Lys Ala Glu Arg Glu Ile Gly Asn Asp Leu Leu
305                 310                 315                 320

Thr Val Glu Asn Leu Thr Val Lys Ile Asp Gly Glu Thr Ile Leu Asp
                325                 330                 335

Asn Ile Ser Phe Ile Leu Arg Pro Asp Asp Lys Thr Ala Leu Ile Gly
            340                 345                 350
```

```
Gln Asn Asp Ile Gln Thr Thr Ala Leu Ile Arg Ala Ile Met Gly Asp
        355                 360                 365

Ile Asp Tyr Glu Gly Thr Val Lys Trp Gly Val Thr Thr Ser Gln Ser
    370                 375                 380

Tyr Leu Pro Lys Asp Asn Ser Ala Asp Phe Ala Gly Gly Glu Ser Ile
385                 390                 395                 400

Leu Asp Trp Leu Arg Gln Phe Ala Ser Lys Glu Glu Asp Asp Asn Thr
                405                 410                 415

Phe Leu Arg Gly Phe Leu Gly Arg Met Leu Phe Ser Gly Asp Glu Val
            420                 425                 430

Asn Lys Pro Val Asn Val Leu Ser Gly Gly Glu Lys Val Arg Val Met
        435                 440                 445

Leu Ser Lys Leu Met Leu Leu Lys Ser Asn Val Leu Val Leu Asp Asp
    450                 455                 460

Pro Thr Asn His Leu Asp Leu Glu Ser Ile Ser Ser Leu Asn Asp Gly
465                 470                 475                 480

Leu Lys Asn Phe Lys Glu Ser Ile Ile Phe Ala Ser His Asp His Glu
                485                 490                 495

Phe Ile Gln Thr Leu Ala Asn His Ile Ile Val Leu Ser Lys Asn Gly
            500                 505                 510

Val Ile Asp Arg Ile Asp Glu Thr Tyr Asp Glu Phe Leu Glu Asn Ala
        515                 520                 525

Glu Val Gln Ala Lys Val Lys Glu Leu Trp Lys Asp
    530                 535                 540
```

<210> 421
<211> 850
<212> PRT
<213> Streptococcus pneumoniae

<400> 421

```
Met Lys Ser Phe Leu Lys Thr Tyr Arg Thr Tyr Phe Ile Ser Phe Ile
1               5                  10                  15

Ile Pro Val Val Ile Met Ser Gly Val Tyr Leu Ser Gln Ser Ile Tyr
            20                  25                  30

Trp Asn Ser Asp Asn Ser Pro Leu Leu Gly Asp Gly Phe His Gln Tyr
        35                  40                  45

Val Ile Phe Asp Val Ala Leu Arg Asn Ile Leu His Gly Asn Ser Asn
    50                  55                  60

Leu Phe Tyr Thr Phe Thr Ser Gly Leu Gly Leu Asn Phe Tyr Ala Leu
65                  70                  75                  80

Ser Ser Tyr Tyr Leu Gly Ser Phe Leu Ala Pro Leu Val Tyr Phe Phe
                85                  90                  95

Asp Leu Thr Asn Met Pro Asp Ala Ile Tyr Leu Thr Thr Leu Leu Lys
            100                 105                 110

Phe Gly Leu Ile Gly Leu Ser Thr Phe Phe Ser Leu Asn Lys Leu Phe
        115                 120                 125

Gln Ser Ile Pro Gln Ile Leu Lys Leu Ala Leu Ser Thr Ser Tyr Ala
    130                 135                 140

Leu Met Ser Phe Thr Val Ser Gln Leu Glu Ile Lys Thr Trp Leu Asp
145                 150                 155                 160

Val Phe Ile Leu Ile Pro Leu Ile Ile Thr Gly Leu His Leu Leu Ile
                165                 170                 175

Thr Glu Lys Lys Leu Leu Leu Tyr Phe Thr Ser Leu Ser Ile Leu Phe
            180                 185                 190

Ile Gln Asn Tyr Tyr Phe Gly Tyr Met Thr Val Leu Phe Leu Ile Phe
        195                 200                 205

Trp Tyr Leu Cys Gln Ile Ser Trp Asp Phe Lys Thr Arg Lys Ser Ser
```

```
    210                 215                 220

Val Leu Asp Phe Ile Val Ile Ser Phe Leu Ala Gly Met Ala Ser Leu
225                 230                 235                 240

Ile Met Thr Leu Pro Thr Leu Phe Asp Leu Gln Thr His Gly Glu Lys
                245                 250                 255

Leu Thr Glu Val Thr Lys Phe Gln Thr Glu Ser Ser Trp Tyr Leu Asp
            260                 265                 270

Leu Phe Ala Lys Gln Phe Ile Gly Ser Phe Asp Thr Thr Lys Tyr Gly
        275                 280                 285

Ala Ile Pro Met Ile Phe Val Gly Leu Phe Pro Phe Ile Leu Thr Ile
    290                 295                 300

Leu Phe Phe Thr Leu Lys Ser Ile Lys Phe His Val Lys Leu Ile Tyr
305                 310                 315                 320

Val Ile Phe Phe Ala Phe Leu Ile Ala Ser Phe Tyr Ile Glu Ala Leu
                325                 330                 335

Asp Leu Phe Trp Gln Gly Met His Thr Pro Asn Met Phe Leu His Arg
            340                 345                 350

Tyr Ala Trp Ile Phe Ser Thr Leu Leu Ile Tyr Thr Ala Ala Glu Val
        355                 360                 365

Leu Lys Arg Leu Lys Glu Leu Lys Val Trp Asn Phe Leu Val Ser Leu
    370                 375                 380

Phe Leu Val Val Ala Gly Phe Leu Ala Thr Ile Tyr Leu Lys Ser His
385                 390                 395                 400

Tyr Ser Phe Leu Thr Asp Leu Asn Ile Leu Leu Thr Leu Glu Phe Leu
                405                 410                 415

Val Val Tyr Ser Leu Leu Leu Leu Ala Val Ile Lys Lys Phe Ile Ser
            420                 425                 430
```

```
Val Asn Leu Phe Ala Ile Leu Ile Ser Leu Phe Ile Leu Val Glu Met
        435                 440                 445

Ser Leu Asn Ala Ser Ser Gln Met Asp Gly Ile Ala Lys Glu Trp Gly
    450                 455                 460

Phe Ala Ser Arg Ser Ala Tyr Ser Arg Asp Ile Pro Ala Met Glu Ser
465                 470                 475                 480

Phe Ser Thr Tyr Ile Gly Asn Gln Phe Thr Arg Thr Glu Lys Leu Gln
                485                 490                 495

Thr Gln Thr Gly Asn Asp Ser Met Lys Phe Asn Tyr Asn Gly Ile Ser
            500                 505                 510

Gln Phe Ser Ser Val Arg Asn Arg Ser Ser Ser Ser Thr Leu Asp Lys
        515                 520                 525

Leu Gly Phe Lys Ser Ser Gly Thr Asn Leu Asn Leu Arg Tyr Ala Asn
    530                 535                 540

Asn Ser Ile Leu Ala Asp Ser Leu Phe Gly Ile Gln Tyr Asn Ile Ser
545                 550                 555                 560

Asp Ser Pro Ile Asp Lys Tyr Gly Phe Lys Asp Ile Tyr Gln Lys Asp
                565                 570                 575

Asn Leu Thr Leu Tyr Glu Asn Gln Tyr Ser Leu Pro Ile Ala Val Ala
            580                 585                 590

Ser Gln Ser Val Tyr Asn Asp Val Lys Phe Asn Glu His Thr Leu Asp
        595                 600                 605

Asn Gln Ala Ser Phe Leu Asn Gln Leu Ala Asn Val Asn Phe Asp Tyr
    610                 615                 620

Phe Ser Pro Ile Pro Tyr Glu Lys Thr Glu Lys Ile Glu Asn Thr Asn
625                 630                 635                 640

Asp Leu Ile Ser Val Thr Ser Ser Ser Asn Glu Asp Ala Ala Ile Gln
                645                 650                 655
```

```
Tyr Gln Ile Glu Val Pro Glu Asn Ser Gln Val Tyr Leu Ser Phe Ile
            660                 665                 670

Asn Leu His Phe Ser Asn Asp Lys Gln Lys Lys Val Asp Ile Leu Val
        675                 680                 685

Asn Gly Glu Lys Lys Thr Phe Thr Thr Asp Asn Val Phe Ser Phe Phe
    690                 695                 700

Asn Leu Gly Tyr Thr Lys Glu Lys Lys Thr Phe Asn Ile Asn Val Ser
705                 710                 715                 720

Phe Pro Gly Asn Ser Gln Val Ser Phe Glu Ser Pro Thr Phe Tyr Arg
                725                 730                 735

Leu Asp Thr Lys Thr Phe Thr Glu Ala Ile Gln Lys Ile Lys Glu Gln
            740                 745                 750

Pro Val Thr Val Ser Thr Ser Lys Asn Lys Val Phe Ala Thr Tyr Asp
        755                 760                 765

Val Gln Gln Asp Thr Ser Ile Phe Phe Thr Ile Pro Tyr Asp Lys Gly
    770                 775                 780

Trp Ser Ala Tyr Gln Asp Gly Lys Lys Ile Glu Ile Lys Gln Ala Gln
785                 790                 795                 800

Thr Gly Phe Met Lys Val Asp Ile Pro Lys Gly Lys Gly Thr Ile Thr
                805                 810                 815

Leu Ser Phe Ile Pro Asn Gly Phe Ile Thr Gly Ala Ile Cys Ser Phe
            820                 825                 830

Thr Ser Leu Leu Leu Phe Gly Ile Tyr Asn His Arg Arg Lys Ser Ser
        835                 840                 845

Lys Ala
    850
```

<210> 422
<211> 250

<212> PRT
<213> Streptococcus pneumoniae

<400> 422

Met Lys Val Leu Ile Leu Glu Asp Val Ile Glu His Gln Val Arg Leu
1 5 10 15

Glu Arg Ile Leu Asp Glu Ile Ser Lys Glu Ser Asn Ile Pro Ile Ser
20 25 30

Tyr Lys Thr Thr Gly Lys Val Arg Glu Phe Glu Glu Tyr Ile Glu Asn
35 40 45

Asp Glu Val Asn Gln Leu Tyr Phe Leu Asp Ile Asp Ile His Gly Ile
50 55 60

Glu Lys Lys Gly Phe Glu Val Ala Gln Leu Ile Arg His Tyr Asn Pro
65 70 75 80

Tyr Ala Ile Ile Val Phe Ile Thr Ser Arg Ser Glu Phe Ala Thr Leu
85 90 95

Thr Tyr Lys Tyr Gln Val Ser Ala Leu Asp Phe Val Asp Lys Asp Ile
100 105 110

Asn Asp Glu Met Phe Lys Lys Arg Ile Glu Gln Asn Ile Phe Tyr Thr
115 120 125

Lys Ser Met Leu Leu Glu Asn Glu Asp Val Val Asp Tyr Phe Asp Tyr
130 135 140

Asn Tyr Lys Gly Asn Asp Leu Lys Ile Pro Tyr His Asp Ile Leu Tyr
145 150 155 160

Ile Glu Thr Thr Gly Val Ser His Lys Leu Arg Ile Ile Gly Lys Asn
165 170 175

Phe Ala Lys Glu Phe Tyr Gly Thr Met Thr Asp Ile Gln Glu Lys Asp
180 185 190

Lys His Thr Gln Arg Phe Tyr Ser Pro His Lys Ser Phe Leu Val Asn
195 200 205

```
Ile Gly Asn Ile Arg Glu Ile Asp Arg Lys Asn Leu Glu Ile Val Phe
    210                 215                 220

Tyr Glu Asp His Arg Cys Pro Ile Ser Arg Leu Lys Ile Arg Lys Leu
225                 230                 235                 240

Lys Asp Ile Leu Glu Lys Lys Ser Gln Lys
                245                 250

<210>  423
<211>  441
<212>  PRT
<213>  Streptococcus pneumoniae

<400>  423

Met Asp Leu Leu Gly Phe Gly Thr Val Ile Val His Phe Leu Ile Ile
1               5                   10                  15

Ser His Ser Tyr Arg Leu Ile Cys Lys Gly Arg Ile Asn Arg Lys Glu
            20                  25                  30

Leu Tyr Val Phe Gly Ala Tyr Thr Leu Leu Thr Glu Ile Val Leu Glu
        35                  40                  45

Phe Ser Phe Tyr Leu Leu Tyr Leu Asp Lys Ile Gly Ile Glu Arg Phe
    50                  55                  60

Leu Phe Pro Leu Gly Leu Tyr Ser Tyr Phe Arg Trp Met Lys Gln Tyr
65                  70                  75                  80

Glu Arg Asp Arg Gly Leu Phe Leu Ser Leu Leu Leu Ser Leu Leu Tyr
                85                  90                  95

Glu Ser Thr His Asn Phe Leu Ser Val Ile Phe Ser Ser Ile Thr Gly
            100                 105                 110

Asp Asn Phe Val Leu Gln Tyr His Phe Pro Phe Phe Phe Val Val Thr
        115                 120                 125

Val Leu Thr Tyr Phe Val Thr Leu Lys Ile Ile Tyr Tyr Phe His Leu
    130                 135                 140
```

```
Glu Leu Ala Tyr Phe Asp Lys Asp Tyr Leu Tyr Pro Phe Leu Lys Lys
145                 150                 155                 160

Val Phe Phe Ala Leu Leu Leu Leu His Ile Val Ser Phe Val Ser Asp
                165                 170                 175

Met Val Ser Thr Ile Lys His Leu Asn Ser Phe Gly Ser Ile Leu Ser
            180                 185                 190

Ser Ile Val Phe Ile Ser Leu Leu Leu Thr Phe Phe Ala Met Asn Ser
        195                 200                 205

His Lys Val Gln Met Glu Lys Glu Ile Ala Leu Lys Gln Lys Lys Phe
    210                 215                 220

Glu Gln Lys His Leu Gln Asn Tyr Thr Asp Glu Ile Val Gly Leu Tyr
225                 230                 235                 240

Asn Glu Ile Arg Gly Phe Arg His Asp Tyr Ala Gly Met Leu Val Ser
                245                 250                 255

Met Gln Met Ala Ile Asp Ser Gly Asn Leu Gln Glu Ile Asp Arg Ile
            260                 265                 270

Tyr Asn Glu Val Leu Val Lys Ala Asn His Lys Leu Arg Ser Asp Lys
        275                 280                 285

Tyr Thr Tyr Phe Asp Leu Asn Asn Ile Glu Asp Ser Ala Leu Arg Ser
    290                 295                 300

Leu Val Ala Gln Ser Ile Val Tyr Ala Arg Asn Asn Gly Val Glu Phe
305                 310                 315                 320

Thr Leu Glu Val Lys Asp Thr Ile Thr Lys Leu Pro Ile Glu Leu Leu
                325                 330                 335

Asp Leu Val Arg Ile Met Ser Val Leu Leu Asn Asn Ala Val Glu Gly
            340                 345                 350

Ser Ala Asp Ser Tyr Lys Lys Gln Met Glu Val Ala Val Ile Lys Met
```

```
        355                 360                 365

Glu Thr Glu Thr Val Ile Val Ile Gln Asn Ser Cys Lys Met Thr Met
    370                 375                 380

Thr Pro Ser Gly Asp Leu Phe Ala Leu Gly Phe Ser Thr Lys Gly Arg
385                 390                 395                 400

Asn Arg Gly Val Gly Leu Asn Asn Val Lys Glu Leu Leu Asp Lys Tyr
                405                 410                 415

Asn Asn Ile Ile Leu Glu Thr Glu Met Glu Gly Ser Thr Phe Arg Gln
            420                 425                 430

Ile Ile Arg Phe Lys Arg Glu Phe Glu
        435                 440


<210>  424
<211>  122
<212>  PRT
<213>  Streptococcus pneumoniae

<400>  424

Met Ser Lys Asn Ile Val Gln Leu Asn Asn Ser Phe Ile Gln Asn Glu
1               5                   10                  15

Tyr Gln Arg Arg Arg Tyr Leu Met Lys Glu Arg Gln Lys Arg Asn Arg
            20                  25                  30

Phe Met Gly Gly Val Leu Ile Leu Ile Met Leu Leu Phe Ile Leu Pro
        35                  40                  45

Thr Phe Asn Leu Ala Gln Ser Tyr Gln Gln Leu Leu Gln Arg Arg Gln
    50                  55                  60

Gln Leu Ala Asp Leu Gln Thr Gln Tyr Gln Thr Leu Ser Asp Glu Lys
65                  70                  75                  80

Asp Lys Glu Thr Ala Phe Ala Thr Lys Leu Lys Asp Glu Asp Tyr Ala
                85                  90                  95

Ala Lys Tyr Thr Arg Ala Lys Tyr Tyr Tyr Ser Lys Ser Arg Glu Lys
```

```
            100                 105                 110

Val Tyr Thr Ile Pro Asp Leu Leu Gln Arg
        115                 120


<210>  425
<211>  420
<212>  PRT
<213>  Streptococcus pneumoniae

<400>  425

Met Glu Glu Val Glu Val Ala Glu Val Lys Asn Ala Arg Val Ser Leu
1               5                   10                  15

Thr Gly Glu Lys Thr Lys Pro Met Lys Leu Ala Glu Val Thr Ser Ile
            20                  25                  30

Asn Val Asn Arg Thr Lys Thr Glu Met Glu Glu Phe Asn Arg Val Leu
        35                  40                  45

Gly Gly Gly Val Val Pro Gly Ser Leu Val Leu Ile Gly Gly Asp Pro
    50                  55                  60

Gly Ile Gly Lys Ser Thr Leu Leu Leu Gln Val Ser Thr Gln Leu Ser
65                  70                  75                  80

Gln Val Gly Thr Val Leu Tyr Val Ser Gly Glu Glu Ser Ala Gln Gln
                85                  90                  95

Ile Lys Leu Arg Ala Glu Arg Leu Gly Asp Ile Asp Ser Glu Phe Tyr
            100                 105                 110

Leu Tyr Ala Glu Thr Asn Met Gln Ser Val Arg Ala Glu Val Glu Arg
        115                 120                 125

Ile Gln Pro Asp Phe Leu Ile Ile Asp Ser Ile Gln Thr Ile Met Ser
    130                 135                 140

Pro Glu Ile Ser Gly Val Gln Gly Ser Val Ser Gln Val Arg Glu Val
145                 150                 155                 160

Thr Ala Glu Leu Met Gln Leu Ala Lys Thr Asn Asn Ile Ala Ile Phe
```

```
                165                 170                 175

Ile Val Gly His Val Thr Lys Glu Gly Thr Leu Ala Gly Pro Arg Met
            180                 185                 190

Leu Glu His Met Val Asp Thr Val Leu Tyr Phe Glu Gly Glu Arg His
        195                 200                 205

His Thr Phe Arg Ile Leu Arg Ala Val Lys Asn Arg Phe Gly Ser Thr
    210                 215                 220

Asn Glu Ile Gly Ile Phe Glu Met Gln Ser Gly Gly Leu Val Glu Val
225                 230                 235                 240

Leu Asn Pro Ser Gln Val Phe Leu Glu Glu Arg Leu Asp Gly Ala Thr
                245                 250                 255

Gly Ser Ser Ile Val Val Thr Met Glu Gly Thr Arg Pro Ile Leu Ala
            260                 265                 270

Glu Val Gln Ala Leu Val Thr Pro Thr Met Phe Gly Asn Ala Lys Arg
        275                 280                 285

Thr Thr Thr Gly Leu Asp Phe Asn Arg Ala Ser Leu Ile Met Ala Val
    290                 295                 300

Leu Glu Lys Arg Ala Gly Leu Leu Leu Gln Asn Gln Asp Ala Tyr Leu
305                 310                 315                 320

Lys Ser Ala Gly Gly Val Lys Leu Asp Glu Pro Ala Ile Asp Leu Ala
                325                 330                 335

Val Ala Val Ala Ile Ala Ser Ser Tyr Lys Asp Lys Pro Thr Asn Pro
            340                 345                 350

Gln Glu Cys Phe Val Gly Glu Leu Gly Leu Thr Gly Glu Ile Arg Arg
        355                 360                 365

Val Asn Arg Ile Glu Gln Arg Ile Asn Glu Ala Ala Lys Leu Gly Phe
    370                 375                 380
```

```
Thr Lys Ile Tyr Val Pro Lys Asn Ser Leu Thr Gly Ile Thr Leu Pro
385                 390                 395                 400

Lys Glu Ile Gln Val Ile Gly Val Thr Thr Ile Gln Glu Val Leu Lys
                405                 410                 415

Lys Val Phe Ala
            420
```

<210> 426
<211> 207
<212> PRT
<213> Streptococcus pneumoniae

<400> 426

```
Met Pro Lys Lys Val Leu Ile Leu Ser Leu Leu Gly Gly Met Phe Leu
1               5                   10                  15

Ser Gly Trp Leu Ser Ser Phe Ala Asn Thr Tyr Ile His Asp Leu Leu
            20                  25                  30

Gly Val Leu Phe Pro Asp Ser Pro Phe Leu Asn Ala Phe Glu Ser Ala
        35                  40                  45

Ile Ala Ala Pro Leu Val Glu Glu Pro Leu Lys Leu Leu Ser Leu Val
    50                  55                  60

Phe Val Leu Ala Leu Ile Pro Val Arg Lys Leu Lys Ser Leu Phe Leu
65                  70                  75                  80

Leu Gly Ile Ala Ser Gly Leu Gly Phe Gln Met Ile Lys Asp Ile Gly
                85                  90                  95

Tyr Ile Arg Thr Asp Leu Pro Glu Gly Phe Asp Phe Thr Ile Ser Arg
            100                 105                 110

Ile Leu Glu Arg Ile Ile Ser Gly Ile Ala Ser His Trp Thr Phe Ser
        115                 120                 125

Gly Leu Ala Val Val Gly Val Tyr Leu Leu Tyr Arg Ala Tyr Lys Gly
    130                 135                 140
```

```
Gln Lys Val Gly Lys Lys Gln Gly Leu Ile Phe Leu Gly Leu Ala Leu
145                 150                 155                 160

Gly Thr His Phe Leu Phe Asn Ser Pro Phe Val Glu Leu Glu Thr Glu
                165                 170                 175

Leu Pro Leu Ala Ile Pro Val Val Thr Ala Ile Ala Leu Tyr Gly Phe
            180                 185                 190

Tyr His Ala Tyr Cys Phe Val Glu Lys His Asn Glu Leu Met Thr
        195                 200                 205
```

<210> 427
<211> 717
<212> PRT
<213> Streptococcus pneumoniae

<400> 427

```
Met Lys Phe Gly Lys Arg His Tyr Arg Pro Gln Val Asp Gln Met Asp
1               5                   10                  15

Cys Gly Val Ala Ser Leu Ala Met Val Phe Gly Tyr Tyr Gly Ser Tyr
            20                  25                  30

Tyr Phe Leu Ala His Leu Arg Glu Leu Ala Lys Thr Thr Met Asp Gly
        35                  40                  45

Thr Thr Ala Leu Gly Leu Val Lys Val Ala Glu Glu Ile Gly Phe Glu
    50                  55                  60

Thr Arg Ala Ile Lys Ala Asp Met Thr Leu Phe Asp Leu Pro Asp Leu
65                  70                  75                  80

Thr Phe Pro Phe Val Ala His Val Leu Lys Glu Gly Lys Leu Leu His
                85                  90                  95

Tyr Tyr Val Val Thr Gly Gln Asp Lys Asp Ser Ile His Ile Ala Asp
            100                 105                 110

Pro Asp Pro Gly Val Lys Leu Thr Lys Leu Pro Arg Glu Arg Phe Glu
        115                 120                 125
```

```
Glu Glu Trp Thr Gly Val Thr Leu Phe Met Ala Pro Ser Pro Asp Tyr
    130                 135                 140

Lys Pro His Lys Glu Gln Lys Asn Gly Leu Leu Ser Phe Ile Pro Ile
145                 150                 155                 160

Leu Val Lys Gln Arg Gly Leu Ile Ala Asn Ile Val Leu Ala Thr Leu
                165                 170                 175

Leu Val Thr Val Ile Asn Ile Val Gly Ser Tyr Tyr Leu Gln Ser Ile
            180                 185                 190

Ile Asp Thr Tyr Val Pro Asp Gln Met Arg Ser Thr Leu Gly Ile Ile
        195                 200                 205

Ser Ile Gly Leu Val Ile Val Tyr Ile Phe Gln Gln Ile Leu Ser Tyr
    210                 215                 220

Ala Gln Glu Tyr Leu Leu Leu Val Leu Gly Gln Arg Leu Ser Ile Asp
225                 230                 235                 240

Val Ile Leu Ser Tyr Ile Lys His Val Phe His Leu Pro Met Ser Phe
                245                 250                 255

Phe Ala Thr Arg Arg Thr Gly Glu Ile Val Ser Arg Phe Thr Asp Ala
            260                 265                 270

Asn Ser Ile Ile Asp Ala Leu Ala Ser Thr Ile Leu Ser Ile Phe Leu
        275                 280                 285

Asp Val Ser Thr Val Val Ile Ile Ser Leu Val Leu Phe Ser Gln Asn
    290                 295                 300

Thr Asn Leu Phe Phe Met Thr Leu Leu Ala Leu Pro Ile Tyr Thr Val
305                 310                 315                 320

Ile Ile Phe Ala Phe Met Lys Pro Phe Glu Lys Met Asn Arg Asp Thr
                325                 330                 335

Met Glu Ala Asn Ala Val Leu Ser Ser Ser Ile Ile Glu Asp Ile Asn
            340                 345                 350
```

```
Gly Ile Glu Thr Ile Lys Ser Leu Thr Ser Glu Ser Gln Arg Tyr Gln
        355                 360                 365

Lys Ile Asp Lys Glu Phe Val Asp Tyr Leu Lys Lys Ser Phe Thr Tyr
    370                 375                 380

Ser Arg Ala Glu Ser Gln Gln Lys Ala Leu Lys Lys Val Ala His Leu
385                 390                 395                 400

Leu Leu Asn Val Gly Ile Leu Trp Met Gly Ala Val Leu Val Met Asp
                405                 410                 415

Gly Lys Met Ser Leu Gly Gln Leu Ile Thr Tyr Asn Thr Leu Leu Val
            420                 425                 430

Tyr Phe Thr Asn Pro Leu Glu Asn Ile Ile Asn Leu Gln Thr Lys Leu
        435                 440                 445

Gln Thr Ala Gln Val Ala Asn Asn Arg Leu Asn Glu Val Tyr Leu Val
    450                 455                 460

Ala Ser Glu Phe Glu Glu Lys Lys Thr Val Glu Asp Leu Ser Leu Met
465                 470                 475                 480

Lys Gly Asp Met Thr Phe Lys Gln Val His Tyr Lys Tyr Gly Tyr Gly
                485                 490                 495

Arg Asp Val Leu Ser Asp Ile Asn Leu Thr Val Pro Gln Gly Ser Lys
            500                 505                 510

Val Ala Phe Val Gly Ile Ser Gly Ser Gly Lys Thr Thr Leu Ala Lys
        515                 520                 525

Met Met Val Asn Phe Tyr Asp Pro Ser Gln Gly Glu Ile Ser Leu Gly
    530                 535                 540

Ser Val Asn Leu Asn Gln Ile Asp Lys Lys Ala Leu Arg Gln Tyr Ile
545                 550                 555                 560

Asn Tyr Leu Ser Gln Gln Pro Tyr Val Phe Asn Gly Thr Ile Leu Glu
                565                 570                 575
```

```
Asn Leu Leu Leu Gly Ala Lys Glu Gly Thr Thr Gln Glu Asp Ile Leu
            580                 585                 590

Arg Ala Val Glu Leu Ala Glu Ile Arg Glu Asp Ile Glu Arg Met Pro
        595                 600                 605

Leu Asn Tyr Gln Thr Glu Leu Thr Ser Asp Gly Ala Gly Ile Ser Gly
    610                 615                 620

Gly Gln Arg Gln Arg Ile Ala Leu Ala Arg Ala Leu Leu Thr Asp Ala
625                 630                 635                 640

Pro Val Leu Ile Leu Asp Glu Ala Thr Ser Ser Leu Asp Ile Leu Thr
                645                 650                 655

Glu Lys Arg Ile Val Asp Asn Leu Ile Ala Leu Asp Lys Thr Leu Ile
            660                 665                 670

Phe Ile Ala His Arg Leu Thr Ile Ala Glu Arg Thr Glu Lys Val Val
        675                 680                 685

Val Leu Asp Gln Gly Lys Ile Val Glu Glu Gly Lys His Ala Asp Leu
    690                 695                 700

Leu Ala Gln Gly Gly Phe Tyr Ala His Leu Val Asn Ser
705                 710                 715


<210>  428
<211>  319
<212>  PRT
<213>  Streptococcus pneumoniae

<400>  428

Met Asp Ile Lys Ile Lys Arg Glu Glu Ile Met Lys Lys Phe Ser Lys
1               5                   10                  15

Thr Leu Arg Asp Asn Trp Ile Phe Leu Leu Met Val Leu Pro Gly Ala
            20                  25                  30

Leu Trp Leu Ile Leu Phe Phe Tyr Ile Pro Val Phe Gly Asn Val Val
        35                  40                  45
```

```
Ala Phe Lys Asp Tyr His Met Thr Ser Asn Gly Phe Ile Asp Ser Ile
    50                  55                  60

Ile Asn Ser Lys Trp Val Gly Leu Asp Asn Phe Arg Phe Leu Phe Ser
65                  70                  75                  80

Ser Arg Asp Ala Phe Ile Ile Thr Arg Asn Thr Val Leu Tyr Asn Leu
                85                  90                  95

Gly Phe Ile Phe Leu Gly Leu Val Val Ser Val Gly Ile Ala Ile Ile
            100                 105                 110

Leu Ser Glu Leu Arg Ser Lys Arg Met Val Lys Ile Phe Gln Thr Ser
        115                 120                 125

Met Leu Phe Pro Tyr Phe Leu Ser Trp Val Ile Ile Ser Phe Phe Thr
    130                 135                 140

Asp Ala Phe Leu Asn Ile Asp Lys Gly Val Phe Asn His Leu Leu Glu
145                 150                 155                 160

Ser Leu Gly Leu Lys Glu Val Asn Phe Tyr Ala Asp Leu Gly Ile Trp
                165                 170                 175

Pro Tyr Leu Leu Leu Phe Leu Gly Ile Trp Lys Gly Phe Gly Tyr Ser
            180                 185                 190

Ser Val Met Tyr Tyr Ala Thr Ile Met Gly Ile Asp Pro Thr Tyr Tyr
        195                 200                 205

Glu Ala Ala Thr Val Asp Gly Ala Ser Lys Trp Gln Arg Ile Arg Asn
    210                 215                 220

Val Thr Ile Pro Gln Leu Thr Pro Leu Val Thr Val Leu Thr Ile Leu
225                 230                 235                 240

Ala Val Gly Asn Ile Phe Arg Ala Asp Phe Gly Leu Phe Tyr Gln Ile
                245                 250                 255

Pro His Asn Ala Gly Gln Leu Tyr Asn Val Thr Asn Val Leu Asp Val
```

```
            260                 265                 270

Tyr Val Phe Asn Gly Leu Thr Gln Thr Ala Asp Ile Gly Met Ala Ala
        275                 280                 285

Ala Ala Gly Leu Tyr Gln Ser Val Val Gly Leu Ile Leu Val Ile Leu
    290                 295                 300

Ser Asn Leu Leu Ala Arg Arg Val Asp Pro Asn Ser Ala Leu Phe
305                 310                 315

<210>  429
<211>  388
<212>  PRT
<213>  Streptococcus pneumoniae

<400>  429

Met Lys Lys Gln Ser Leu Phe Phe Val Pro Gly Ile Ile Leu Ile Gly
1               5                   10                  15

Val Ser Leu Arg Thr Pro Phe Thr Val Leu Pro Ile Ile Leu Gly Asn
            20                  25                  30

Ile Ser Gln Gly Leu Glu Val Glu Val Ser Ser Leu Gly Val Leu Thr
        35                  40                  45

Ser Leu Pro Leu Leu Met Phe Thr Leu Phe Ser Pro Phe Ser Thr Gln
    50                  55                  60

Leu Ala Gln Lys Ile Gly Leu Glu His Leu Phe Thr Tyr Ser Leu Phe
65                  70                  75                  80

Phe Leu Thr Ile Gly Ser Leu Ile Arg Leu Ile Asn Leu Pro Leu Leu
                85                  90                  95

Tyr Leu Gly Thr Leu Met Val Gly Ala Ser Val Ala Val Ile Asn Val
            100                 105                 110

Leu Leu Pro Ser Leu Ile Gln Ala Asn Gln Pro Lys Lys Ile Gly Phe
        115                 120                 125

Leu Thr Thr Leu Tyr Val Thr Ser Met Gly Ile Ala Thr Ala Leu Ala
```

```
    130                 135                 140

Ser Tyr Leu Ala Val Pro Ile Thr Gln Ala Ser Ser Trp Lys Gly Leu
145                 150                 155                 160

Ile Leu Leu Leu Thr Leu Leu Cys Leu Ala Thr Phe Leu Val Trp Leu
                165                 170                 175

Pro Asn His Arg Tyr Asn His Arg Leu Ala Pro Gln Thr Lys Gln Lys
            180                 185                 190

Ser Gln Ile Lys Val Met Arg Asn Lys Gln Val Trp Ala Ile Ile Ile
        195                 200                 205

Phe Ser Gly Phe Gln Ser Leu Ile Phe Tyr Thr Val Met Thr Trp Leu
    210                 215                 220

Pro Thr Met Ser Ile His Ala Gly Leu Ser Ser His Glu Ala Gly Leu
225                 230                 235                 240

Leu Thr Ser Ile Leu Ser Leu Ile Ser Ile Pro Phe Ser Met Thr Ile
                245                 250                 255

Pro Ser Leu Thr Thr Ser Leu Ser Thr Arg Asn Arg Gln Leu Met Leu
            260                 265                 270

Thr Leu Val Ser Leu Ala Gly Val Val Gly Ile Ser Met Leu Phe Phe
        275                 280                 285

Pro Ile Asn Asn Phe Ile Tyr Trp Leu Ala Ile His Leu Leu Ile Gly
    290                 295                 300

Thr Ala Thr Ser Ala Leu Phe Pro Tyr Leu Met Val Asn Phe Ser Leu
305                 310                 315                 320

Lys Thr Ser Ala Pro Glu Lys Thr Ala Gln Leu Ser Gly Leu Ser Gln
                325                 330                 335

Thr Gly Gly Tyr Ile Leu Ala Ala Phe Gly Pro Thr Leu Phe Gly Tyr
            340                 345                 350
```

```
Ser Phe Asp Leu Phe His Ser Trp Val Pro Ser Val Ala Ala Leu Leu
        355                 360                 365

Leu Ile Asp Ile Leu Met Thr Val Ala Leu Phe Thr Val Asp Arg Ala
    370                 375                 380

Asp Lys Ile Leu
385
```

<210> 430
<211> 150
<212> PRT
<213> Streptococcus pneumoniae

<400> 430

```
Met Asp Phe Leu Phe Ala Ala Gly Ala Phe Gly Leu Val Ile Ala Asn
1               5                   10                  15

Asn Ala Ser Ile Ser Gly Ala Glu Gly Gly Cys Gln Ala Glu Val Gly
            20                  25                  30

Ser Ala Ser Ala Met Ser Ala Ala Ala Leu Thr Leu Ala Ala Gly Gly
        35                  40                  45

Thr Pro Tyr Gln Ala Ser Gln Ala Ile Ala Phe Val Ile Lys Asn Met
    50                  55                  60

Leu Gly Leu Ile Cys Asp Pro Val Ala Gly Leu Val Glu Val Pro Cys
65                  70                  75                  80

Val Lys Arg Asn Ala Met Gly Ala Ser Phe Ala Phe Ile Ala Ala Asp
                85                  90                  95

Met Ala Leu Ala Gly Ile Glu Ser Lys Ile Pro Val Asp Glu Val Ile
            100                 105                 110

Asp Ala Met Tyr Gln Val Gly Ala Ser Met Pro Thr Ala Phe Arg Glu
        115                 120                 125

Thr Ala Glu Gly Gly Leu Ala Thr Thr Pro Thr Gly Arg Arg Leu Gln
    130                 135                 140
```

Lys Glu Ile Phe Gly Glu
145 150

<210> 431
<211> 663
<212> DNA
<213> Streptococcus pneumoniae

<400> 431
ggaagtagtt ttatgaatat agcagtaatt ggtttggggc atgttgggct ggcctacgcg 60

ttactatttg catctaaata taaagttgtt gcatatgata tagattctgt aaaaataaat 120

aatttaaaaa agggcattct tccatctaaa aatgaagagc ttatgaagtt tttttgcgag 180

aataacttaa atattacttt ttttgataca ttttctgaaa ttaaaaataa tattgattat 240

tatattattg cgcttccgac agattatgat gagaaaattg gtagttttaa tacatatgaa 300

atcgaacaaa cggtatcgaa gattctgagg gtaaaaccta atggaaagat tattttaaag 360

tcaacagttc cgatcggctt ttcaaacaaa ttaaaaaggc tgtttgatac aaaaaatatc 420

atttttgtcc ctgaattttt gagagaaggt tgttctatat atgataattt atatccaagt 480

cgcatagttg ttggagatga gacagttgaa ggaagaaaaa ttgcagagtt gttcctttcg 540

attagtactc atagtactgc caatattaaa aatgttatgt tagtttctcc tactgaagca 600

gaagcaatta agctttttc taacacattc ttagctctcc gtgttgcttt tttaatgaac 660

tag 663

<210> 432
<211> 708
<212> DNA
<213> Streptococcus pneumoniae

<400> 432
aaaatggttc taagaggagt tcctatgtct caaattgatc tacaaaaatt aactaagaaa 60

aaccaagagt ttgtccacat tgctacccaa caattcatca aagatgggaa aacagacgct 120

gaaatccaga ctatttttga ggaagtcatt ccccaaatcc ttgaggagca atctaaaggt 180

acaactgccc gttccctata cggcgcacca actcattggg ctcatagctt cactgtcaaa 240

gagcagtacg aaaaagagca tccaaaagaa aatgatgacc caaaactgat gattatggac 300

tcagctcttt tcatcactag cctctttgcc cttgtcagcg ccctcacaac cttctttgcg 360

gcagaccaag ctttcggcta tggattgatt actcttctat tagttggact ggttggtgga 420

tttgccttct acttgatgta ctactttgtt taccaatact atggaccaga tatggatcgc 480

agtcaacgtc caccttctg gaaatctgta ctagttatcc tagcttctat gttcctttgg 540

ttgcttgtct tctttgcaac aagcttccta ccagctagcc ttaacccagt actggatcca 600

ttgccactag ctattattgg agcagccctc ctagcccttc gcttctatct caagaaacgc 660

ttgaatatcc gtagtgcaag tgcaggacca acacgctatc aagaataa 708

<210> 433
<211> 960
<212> DNA
<213> Streptococcus pneumoniae

<400> 433
gaaaggataa gggatatgaa acaagttttt ctctctacaa caactgaatt taaagagatc 60

gatacgcttg aaccgggtac ttggatcaat ctcgtcaatc cgactcaaaa tgaatcactc 120

gaaatcgcca acaccttcga tattgatatt gctgaccttc gagcaccgct cgatgcggaa 180

gaaatgtctc gtattaccat tgaagacgag tataccctga ttatcgtaga cgtgccggtc 240

acggaggaaa gaaataaccg cacctactac gtaaccatcc cgcttggtat tatcatcact 300

gaggaaacca ttatcactac gtgtttggaa ccactacctg tccttgatgt ctttatcaac 360

cgtcgattgc gtaatttcta taccttcatg cgttcacgtt ttatctttca aattctttat 420

cgcaatgcag agctttacct aacagccctt cgttcaatcg accgcaagag tgaacaaatc 480

gaaagtcaac tgcatcaatc aactcgtaat gaagaattga ttgagctcat ggaattggaa 540

aaaactatcg tctatttcaa ggcctccctc aaaacaaatg agcgcgtgat taagaaattg 600

accagttcaa ccagcaatat caagaaatac cttgaggacg aagacctgct tgaagacacc 660

ctgattgaaa cccaacaggc catcgagatg gcagatattt atggaaacgt cttgcattct 720

atgacagaga cctttgcctc tatcatttct aacaaccaga acaacatcat gaaaaccttg 780

gcccttgtga ccatcgtcat gtccatccca accatggtct tttctgccta cgggatgaac 840

tttaaggata atgaaatccc cctaaacgga gagccaaatg ccttctggtt aatcgtcttt 900

atcgcctttg ctatgagtgt ctcgctcact ctctatctca tccataaaaa atggttctaa 960

<210> 434
<211> 330
<212> DNA
<213> Streptococcus pneumoniae

<400> 434
atagacgaaa aggagaaaaa gatggcaaac aaaaaaatcc gtatccgttt gaaagcttac 60

gaacaccgta cgcttgacac agcggctgca aaaatcgtag aatcagctac tcgtacaggt 120

gcacaagttg cgggtccaat cccacttcca actgaacgta gcctctacac aatcattcgt 180

gcgactcaca aatacaaaga ctctcgcgaa caatttgaaa tgcgtacaca caaacgtttg 240

atcgatatcg ttaacccaac tcaaaaaaca gttgatgcct tgatgaaatt ggatcttcca 300

agtggtgtaa acgtagaaat caaactttaa 330

<210> 435
<211> 645
<212> DNA
<213> Streptococcus pneumoniae

<400> 435
aaaaggaact attttctcat gacaaaagga atcttaggga aaaaagtggg aatgactcaa 60

atcttcactg aagctggcga attgatccct gtaacagtta ttgaagcaac tccaaacgtt 120

gttcttcaag ttaaaactgt tgaaacagac ggatacaacg ctatccaagt tggtttcgat 180

gacaaacgcg aagtattgag caacaaacct gctaaaggac atgtagcgaa agctaacacg 240

gctcctaagc gcttcattcg tgaattcaaa aacgttgaag gcttggaagt tggtgctgaa 300

attacagttg aaacattcgc agctggagac gttgttgacg taacgggtac ttctaaaggt 360

aaaggtttcc aaggtgttat caaacgccac ggacaatcac gtggaccaat ggctcacggt 420

tctcgttacc accgtcgtcc aggttctatg gggcctgttg cacctaaccg cgtattcaaa 480

ggtaaaaacc ttgcaggacg tatgggtggc gaccgcgtaa caattcaaaa ccttgaagtt 540

gtacaagttg ttccagaaaa gaacgttatc cttatcaaag gtaacgtacc aggtgctaag 600

aaatctctta tcactatcaa atcagcagtt aaagctggta aataa 645

<210> 436
<211> 645
<212> DNA
<213> Streptococcus pneumoniae

<400> 436
agaaagggga aatcagtcac aatggcaaac gtaacattat ttgaccaaac tggtaaagaa 60

gctggccaag ttgttcttag cgatgcagta tttggtatcg aaccaaatga atcagttgtg 120

tttgatgtaa tcatcagcca acgcgcaagc cttcgtcaag gaacacacgc tgttaaaaac 180

cgctctgcag tatcaggtgg tggacgcaaa ccatggcgtc aaaaaggaac tggacgtgct 240

cgtcaaggtt ctatccgctc accacaatgg cgtggtggtg gtgttgtctt cggaccaact 300

ccacgttcat acggctacaa acttccacaa aaagttcgtc gcctagctct taaatcagtt 360

tactctgaaa aagttgctga aaacaaattc gtagctgtag acgctctttc atttacagct 420

ccaaaaactg ctgaatttgc aaaagttctt gcagcattga gcatcgattc taaagttctt 480

gttatccttg aagaaggaaa tgaattcgca gctctttcag ctcgtaacct tccaaacgtg 540

aaagttgcaa ctgctacaac tgcaagtgtt cttgacatcg caaatagcga caaacttctt 600

gtcacacaag cagctatctc taaaatcgag gaggttcttg cataa 645

<210> 437
<211> 318
<212> DNA
<213> Streptococcus pneumoniae

<400> 437
aatcgaggag gttcttgcat aatgaatttg tatgatgtta tcaaaaaacc tgtcatcact 60

gaaagctcaa tggctcaact tgaagcagga aaatatgtat ttgaagttga cactcgtgca 120

cacaaacttt tgatcaagca agctgttgaa gctgctttcg aaggtgttaa agttgccaat 180

gttaacacaa tcaacgtaaa accaaaagct aaacgtgttg gacgttacac tggttttact 240

aacaaaacta aaaaagctat catcacactt acagctgatt ctaaagcaat cgagttgttt 300

gctgctgaag ctgaataa 318

<210> 438
<211> 846
<212> DNA
<213> Streptococcus pneumoniae

<400> 438
ggaggaaata tcgtgggaat tcgtgtttat aaaccaacaa caaacggtcg ccgtaatatg 60

acttctttgg atttcgctga aatcacaaca agcactcctg aaaaatcatt gcttgttgca 120

ttgaagagca aggctggtcg taacaacaac ggtcgtatca cagttcgtca ccaaggtggt 180

ggacacaaac gtttctaccg tttggttgac ttcaaacgta ataaagacaa cgttgaagca 240

gttgttaaaa caatcgagta cgatccaaac cgttctgcaa acatcgctct tgtacactac 300

actgacggtg tgaaagcata catcatcgct ccaaaaggtc ttgaagtagg tcaacgtatc 360

gtttcaggtc cagaagcaga tatcaaagtc ggaaacgctc ttccacttgc taacatccca 420

gttggtactt tgattcacaa catcgagttg aaaccaggtc gtggtggtga attggtacgt 480

gctgctggtg catctgctca agtattgggt tctgaaggta aatatgttct tgttcgtctt 540

caatcaggtg aagttcgtat gattcttgga acttgccgtg ctacagttgg tgttgtcgga 600

aacgaacaac atggacttgt aaaccttggt aaagcaggac gtagccgttg gaaaggtatc 660

cgcccaacag ttcgtggttc tgtaatgaac cctaacgatc acccacacgg tggtggtgaa 720

ggtaaagcac cagttggtcg taaagcacca tctactccat ggggcaaacc tgctcttggt 780

cttaaaactc gtaacaagaa agcgaaatct gacaaactta tcgttcgtcg tcgcaacgag 840

aaataa 846

<210> 439
<211> 366
<212> DNA
<213> Streptococcus pneumoniae

<400> 439
gcaactagta aatccgccag ctcggtagcg ctccatagga gtgcaagccg ctgtggtaca 60

acatttaaag gagaaaatat aaaaatggga cgcagtctta aaaaaggacc tttcgtcgat 120

gagcatttga tgaaaaaagt tgaagctcaa gctaacgacg aaaagaaaaa agttattaaa 180

acttggtcac gtcgttcaac gatcttccca agtttcattg gttacactat tgcagtttat 240

gacggacgta aacacgtacc tgtttacatc caagaagaca tggtaggcca caaacttggt 300

gaatttgcac caactcgtac ttacaaaggt cacgctgcag acgacaagaa aacacgtaga 360

aaataa 366

<210> 440
<211> 345
<212> DNA
<213> Streptococcus pneumoniae

<400> 440
atggcagaaa ttacttcagc taaagcaatg gctcgtacag tacgtgtttc acctcgtaaa 60

tcacgtcttg ttcttgataa catccgtggt aaaagcgtag ccgatgcaat cgcaatcttg 120

acattcactc caaacaaagc tgctgaaatc atcttgaaag ttttgaactc agctgtagct 180

aacgctgaaa acaactttgg tttggataaa gctaactttgg tagtatctga agcattcgca 240

aacgaaggac caactatgaa acgtttccgt ccacgtgcga aaggttcagc ttcaccaatc 300

aacaaacgta cagctcacat cactgtagct gttgcagaaa aataa 345

<210> 441
<211> 666
<212> DNA
<213> Streptococcus pneumoniae

<400> 441
ggaggtaaaa tcgtgggtca aaaagtacat ccaattggta tgcgtgtcgg catcatccgt 60

gattgggatg ccaaatggta tgctgaaaaa gaatacgcgg attaccttca tgaagatctt 120

gcaatccgta aattcgttca aaaagaactt gctgacgcag cagtttcaac tattgaaatc 180

gaacgcgcag taaacaaagt taacgtttca cttcacactg ctaaaccagg tatggttatc 240

ggtaaaggtg gtgctaacgt tgatgcactc cgtgcaaaac ttaacaaatt gactggaaaa 300

caagtacaca tcaacatcat cgaaatcaaa caacctgatt tggatgctca ccttgtaggt 360

gaaggaattg ctcgtcaatt ggagcaacgt gttgctttcc gtcgtgcaca aaaacaagca 420

atccaacgtg caatgcgtgc tggagctaaa ggaatcaaaa ctcaagtatc aggtcgtttg 480

aacggtgcag atatcgcccg tgctgaagga tactctgaag gaactgttcc gcttcacaca 540

cttcgtgcag atatcgatta cgcttgggaa gaagcagata ctacatacgg taaacttggt 600

gttaaagtat ggatctaccg tggtgaagtt cttccagctc gtaaaaacac taaaggaggt 660

aaataa 666

<210> 442
<211> 384
<212> DNA
<213> Streptococcus pneumoniae

<400> 442
aaggagaaaa ctgaaatgat tcaaacagaa actcgtttga aagtcgcaga caacagcggt 60

gctcgcgaaa tcttgactat caaagttctt ggtggttcag gacgtaaatt tgcaaacatc 120

ggtgatgtta tcgtggcatc tgtaaaacaa gctactcctg gtggtgcggt taaaaaaggt 180

gacgttgtta aagcagttat cgttcgtact aaatcaggtg ctcgtcgtgc tgatggttca 240

tacatcaaat ttgacgaaaa cgcagcagtt atcatccgtg aagacaaaac tcctcgcgga 300

acacgtatct ttggcccagt tgcacgtgaa ttgcgtgaag gtggcttcat gaagatcgtg 360

tcacttgctc cagaagtact ttaa 384

<210> 443
<211> 327
<212> DNA
<213> Streptococcus pneumoniae

<400> 443
gaaaaatcaa ggagaaacct aatgtttgta aaaaaaggcg acaaagttcg cgtaatcgct 60

ggtaaagata agggaacaga agctgttgtc cttactgccc ttccaaaagt aaacaaagtt 120

atcgttgaag gtgttaacat tgttaagaaa caccaacgtc caactaacga gcttcctcaa 180

ggtggtatca tcgagaaaga agcagctatc cacgtatcaa acgttcaagt tttggacaaa 240

aatggtgtag ctggtcgtgt tggatacaaa tttgtagacg gtaaaaaagt tcgctacaac 300

aaaaaatcag gcgaagtgct tgattaa 327

<210> 444
<211> 570
<212> DNA
<213> Streptococcus pneumoniae

<400> 444
ttaatcacga aggaaaggag aagtataatg gcaaatcgtt taaaagaaaa atatcttaat 60

gaagtagttc ctgctttgac agaacaattc aactactcat cagtgatggc tgtgcctaaa 120

gtagataaga ttgttttgaa catgggtgtt ggtgaagctg tatcaaacgc taaaagcctt 180

gaaaaagctg ctgaagaatt ggcacttatc tcaggtcaaa aaccacttat cactaaagct 240

aaaaaatcaa tcgccggctt ccgtcttcgt gaaggtgttg cgatcggtgc aaaagttacc 300

cttcgtggtg aacgtatgta cgaattcttg gataaattgg tatcagtttc acttccacgt 360

gtacgtgact tccacggtgt cccaacaaaa tcatttgatg gacgcgggaa ctacacactt 420

ggtgtgaaag aacaattaat cttcccagaa atcaacttcg atgacgttga caaaactcgt 480

ggtcttgaca tcgttatcgt aacaactgct aacactgacg aagagtcacg tgcattgctt 540

acaggccttg gaatgccttt tgcaaaataa 570

<210> 445
<211> 414
<212> DNA
<213> Streptococcus pneumoniae

<400> 445
gaggagaaaa acaaaatggt tatgactgac ccaatcgcag acttcctaac tcgtattcgt 60

aatgctaacc aagctaaaca cgaagtactt gaagtacctg catcaaacat caaaaaaggg 120

attgctgaaa tccttaaacg cgaaggtttt gtaaaaaacg ttgaaatcat tgaagatgac 180

aaacaaggcg tcatccgtgt atttcttaaa tacggaccaa atggtgagaa agttatcact 240

aacttgaaac gtgtttctaa accaggactt cgtgtctaca aaaaacgtga agaccttcca 300

aaagttctta acggacttgg aattgccatc ctttcaactt ctgaaggttt gcttactgat 360

aaagaagcac gccaaaagaa tgttggtggt gaggttatcg cttacgtttg gtaa 414

<210> 446
<211> 552
<212> DNA
<213> Streptococcus pneumoniae

<400> 446
caggagaaaa taaacatgtc acgtattggt aataaagtta tcgtgttgcc tgctggtgtt 60

gaactcgcta acaatgacaa cgttgtaact gtaaaaggat ctaaaggaga acttactcgt 120

gagttctcaa aagatattga aatccgtgtg gaaggtactg aaataactct tcaccgtcca 180

aacgattcaa aagaaatgaa aactatccac ggaactactc gtgccctttt gaacaacatg 240

gttgttggtg tatcagaagg attcaagaaa gaacttgaaa tgcgtggggt tggttaccgt 300

gcacagcttc aaggatctaa acttgttttg gctgttggta aatctcatcc agacgaagtt 360

gaagctccag aaggaattac ttttgaactt ccaaacccaa caacaatcgt tgttagcgga 420

atttcaaaag aagtagttgg tcaaacagct gcttacgtac gtagccttcg ttcaccagaa 480

ccatataaag gtaaaggtat ccgttacgtt ggtgaattcg ttcgccgtaa agaaggtaaa 540

acaggtaaat aa 552

<210> 447
<211> 426
<212> DNA
<213> Streptococcus pneumoniae

<400> 447
tcatcaacca ccaacctatt ttccaacttt gtgcatagca cacgatttaa aactaaagag 60

gtgaaaactg tgatttcaaa accagataaa aacaaactcc gccaaaaacg ccaccgtcgc 120

gttcgcggaa aactctctgg aactgctgat cgcccacgtt tgaacgtatt ccgttctaat 180

acaggcatct acgctcaagt gattgatgac gtagcgggtg taacgctcgc aagtgcttca 240

actcttgata aagaagtttc aaaaggaact aaaactgaac aagccgttgc tgtcggtaaa 300

ctcgttgcag aacgtgcaaa cgctaaaggt atttcagaag tggtgttcga ccgcggtgga 360

tatctatatc acggacgtgt gaaagctttg gctgatgcag ctcgtgaaaa cggattgaaa 420

ttctaa 426

<210> 448
<211> 498
<212> DNA
<213> Streptococcus pneumoniae

<400> 448
aaaatggcat ttaaagacaa tgcagttgaa ttagaagaac gcgtagttgc tgtcaaccgt 60

gttacaaaag ttgttaaagg tggacgtcgt cttcgtttcg cagctcttgt tgttgttggt 120

gaccacaatg gtcgcgtagg atttggtact ggtaaagctc aagaagttcc agaagcaatc 180

cgtaaagcag tagatgatgc taagaaaaac ttgatcgaag ttcctatggt tggaacaaca 240

atcccacacg aagttctttc agaattcggt ggagctaaag tattgttgaa acctgctgta 300

gaaggttctg gagttgccgc tggtggtgca gttcgtgccg ttgtggaatt ggcaggtgtg 360

gcagatatta catctaaatc acttggttct aacactccaa tcaacattgt tcgtgcaact 420

gttgaaggtt tgaaacaatt gaaacgcgct gaagaaattg ctgcccttcg tggtatttca 480

gtttctgatt tggcataa 498

<210> 449
<211> 468
<212> DNA
<213> Streptococcus pneumoniae

<400> 449
cattttacaa aagaggagaa aataaaaatg aaacttcatg aattgaaacc tgcagaaggt 60

tctcgtaaag tacgtaaccg cgttggtcgt ggtacttcat caggtaacgg taaaacatct 120

ggtcgtggtc aaaaaggtca aaaagctcgt agcggtggcg gagttcgcct tggttttgaa 180

ggtggacaaa ctccattgtt ccgtcgtctt ccaaaacgtg gattcactaa catcaacgct 240

aaagaatacg caattgtgaa ccttgaccaa ttgaacgtct ttgaagatgg tgctgaagta 300

actccagttg ttcttatcga agcaggaatt gttaaagctg aaaagtcagg tattaaaatt 360

cttggtaacg gtgagttgac taagaaattg actgtgaaag cagctaaatt ctctaaatca 420

gctgaagaag ctatcactgc taaaggtggt tcagtagaag tcatctaa 468

<210> 450
<211> 1314
<212> DNA
<213> Streptococcus pneumoniae

<400> 450
cctatgtttt ttaaattatt aagagaagct cttaaagtca agcaggttcg atcaaaaatt 60

ttatttacaa tttttatcgt tttggtcttt cgtatcggaa ctagcattac agttcctggt 120

gtgaatgcca atagcttgaa tgctttaagt ggattatcct tcttaaacat gttgagcttg 180

gtgtcgggga atgccctaaa aaacttttcg atttttgccc taggagttag tccctatatc 240

accgcttcta ttgttgtcca actcttgcaa atggatattt tacccaagtt tgtagagtgg 300

ggtaaacaag gggaagtagg tcgaagaaaa ttgaatcaag ctactcgtta tattgctcta 360

gttctcgctt ttgtgcaatc tatcgggatt acagctggtt ttaatacctt ggctggagct 420

caattgatta aaactgcttt aactccacaa gtttttctga cgattggtat catcttaaca 480

gctggtagta tgattgtcac ttggttgggt gagcaaatta cagataaggg atacggaaac 540

ggtgtttcca tgattatctt tgccgggatt gtttcctcaa ttccagagat gattcagggc 600

atctatgtgg actactttgt gaacgtccca agtagccgta tcacttcatc tatcattttc 660

gtaatcattt tgattattac tgtattgttg attatttact ttacaactta tgttcaacaa 720

gcagaataca aaattccaat ccaatatact aaggttgcac aaggtgctcc atctagctct 780

taccttccgt taaaagtaaa ccctgctgga gttatccctg ttatctttgc cagttcgatt 840

actgcagcgc ctgcggctat tcttcagttt ttgagtgcca caggtcatga ttgggcttgg 900

gtaagggtag cacaagagat gttggcaact acttctccaa ctggtattgc catgtatgct 960

ttgttgatta ttctctttac attcttctat acgtttgtac agattaatcc tgaaaaagca 1020

gcagagagcc tacaaaagag tggtgcctat atccatggag ttcgtcctgg taaaggtaca 1080

gaagaatata tgtctaaact tcttcgtcgt cttgcaactg ttggttccct cttccttggt 1140

gtgatttcca ttttaccgat tgcagctaaa gatgtatttg gtctttctga tgttgttgcc 1200

tttggtggaa caagtctctt gatcattatc tctacaggta tcgaaggaat caagcaattg 1260

gaaggttacc tattgaaacg taagtatgtt ggtttcatgg acagaacaga ataa 1314

<210> 451
<211> 651
<212> DNA
<213> Streptococcus pneumoniae

<400> 451
ggagatcaaa tcatgaatct tttgattatg ggcttacctg gtgcaggtaa gggaactcaa 60

gcagcaaaaa tcgtagaaca attccatgtt gcacatatct caacaggtga tatgttccgc 120

gctgcaatgg caaatcaaac tgaaatgggt gttcttgcta agtcatatat tgacaagggt 180

gaattggttc ctgacgaagt tacaaatgga atcgtaaaag aacgcctttc acaagatgat 240

attaaagaaa caggattctt attggatggt tacccacgta caattgaaca agctcatgcc 300

ttggacaaaa cattggctga acttggcatt gaactagaag gtgttatcaa tattgaagtg 360

aaccctgaca gcctttgga acgtttgagt gggcgtatca tccaccgcgt aactggagaa 420

actttccaca aggtctttaa cccaccagtt gactataaag aagaagatta ctaccaacgt 480

gaagatgata agcctgagac agtaaaacgt cgtttggatg ttaatattgc tcaaggagaa 540

ccaatcattg ctcactaccg tgccaaaggt ttggttcatg acatcgaagg taatcaagat 600

atcaatgatg tcttctcaga tattgaaaaa gtattgacaa atttgaaata a 651

<210> 452
<211> 378
<212> DNA
<213> Streptococcus pneumoniae

<400> 452
aaaggagaaa acatggctcg tattgctgga gttgatattc caaatgacaa acgcgtagta 60

atctcattga cttatgttta tggtatcgga cttgcaacat ctaagaaaat tttggctgct 120

gctggaatct cagaagatgt tcgtgtacgt gatcttacat cagatcaaga agatgctatc 180

cgtcgtgaag tggatgcaat caaagttgaa ggtgaccttc gtcgtgaagt aaacttgaac 240

atcaaacgtt tgatggaaat cggttcatac cgtggtatcc gtcaccgtcg tggacttcct 300

gtccgtggac aaaacactaa aaacaacgcc cgcactcgta aaggtaaagc tgttgcgatt 360

gctggtaaga aaaaataa 378

<210> 453
<211> 396
<212> DNA
<213> Streptococcus pneumoniae

<400> 453
gaggtaaaag tcttggctaa accaacacgt aaacgtcgtg tgaaaaagaa tatcgaatct 60

ggtattgctc atattcacgc tacatttaat aacactattg ttatgattac tgatgtgcat 120

ggtaatgcaa ttgcttggtc atcagctggt gctcttggtt tcaaaggttc tcgtaaatct 180

acaccattcg ctgctcaaat ggcttctgaa gctgctgcta aatctgcaca agaacacggt 240

cttaaatcag ttgaagttac tgtaaaaggt ccaggttctg gtcgtgagtc agctattcgt 300

gcgcttgctg ccgctggtct tgaagtaaca gcaattcgtg atgtgactcc agtgccacac 360

aatggtgctc gtcctccaaa acgtcgccgt gtataa 396

<210> 454
<211> 402
<212> DNA
<213> Streptococcus pneumoniae

<400> 454
ataaaggagg aatacatggc ttaccgtaaa ctaggacgca ctagctcaca acgtaaagca 60

atgcttcgcg atttgacaac tgacctttg atcaacgaat caatcgtgac aactgaagct 120

cgtgctaaag aaatccgtaa aactgttgaa aaaatgatta ctctaggtaa acgtggtgat 180

ttgcatgcac gtcgtcaagc agctgctttc gtacgtaatg aaatcgcatc tgaaaactat 240

gatgaagcaa ctgataagta cacttctact acagcacttc aaaaattgtt ctcagaaatc 300

gcacctcgtt atgctgaacg taacggtgga tacactcgta tccttaaaac tgaatcacgt 360

cgtggtgatg cagcgccaat ggcgatcatc gaattagtat aa 402

<210> 455
<211> 414
<212> DNA
<213> Streptococcus pneumoniae

<400> 455
atgcctacaa ttaaccaatt ggttcgcaaa ccgcgtaaat caaaagtaga aaaatctaaa 60

tcaccagctt tgaacgttgg ttacaatagt cataaaaaag ttcaaacaaa cgtttcttca 120

ccacaaaaac gtggtgttgc aactcgtgtt ggaacaatga cacctaaaaa acctaactca 180

gcccttcgta aattcgctcg tgtacgtttg agcaaccttа tcgaagttac tgcctacatc 240

ccaggtatcg gacacaactt gcaagagcac agcgtggtgc ttcttcgcgg tggacgtgta 300

aaagaccttc caggggtacg ttaccatatc gtccgtggtg cacttgatac tgcaggtgtt 360

aacgatcgta aacaaggccg ttctaaatac ggtactaaac gtccaaaagc ataa 414

<210> 456

<211> 477
<212> DNA
<213> Streptococcus pneumoniae

<400> 456
agagaaatga gtcgtaaaaa tagagctcca aaacgtgacg tattgccaga tccgctatac 60

aattcacaac tagttactcg tcttatcaac cgcgttatgc ttgatggtaa acgtggtact 120

gctgcttcaa tcgtttacgg tgcttttgag caaatcaaag aagctactgg caacgatgca 180

cttgaagtat ttgaaacagc tatggaaaac atcatgcctg tacttgaagt acgtgcacgt 240

cgtgttggtg gttctaacta ccaagtccca gttaaagttc gtccagaacg tcgtacaaca 300

cttggacttc gttggttggt aacaatcgct cgtcttcgtg gtgaacacac aatgcaagac 360

cgtcttgcaa aagaaatctt ggatgctgct aacaacactg gtgcagcagt taagaaacgt 420

gaagatactc accgtatggc tgaagctaac cgtgcattcg cacacttccg ttggtaa 477

<210> 457
<211> 930
<212> DNA
<213> Streptococcus pneumoniae

<400> 457
gaaaggactg aaaacatcat gactgaaaaa cttcaattaa ctaaatcaga tcgtaaaaaa 60

gtttggtggc gttcaacctt cttacaaggg tcttggaact ttgaacggat gcaaaacttg 120

ggctgggctt atacactcat tccagctatc aaaaaactct atactaaaaa agaagatcaa 180

atcgctgctc ttgagcgtca ccttgagttc ttcaacactc atccatacgt agctgctcca 240

gtcatggggg ttactcttgc gcttgaagaa gaacgtgcta acggtgtgga aatcgatgac 300

gctgctatcc aaggggttaa aatcggtatg atgggacctc ttgctggtat cggtgaccca 360

gtattctggt ttacagtacg cccaatcctt ggatctctcg gtgcttcact tgcccttact 420

ggcaatatct tggggccact cctcttcttt gttgcatgga acttgattcg tatgtcattc 480

ttgtggtatg ttcaagagat tggatacaag gctggatcag aaatcactaa agatatgtct 540

ggtggtatcc ttcaagatat cactaaagga gcttctatcc ttgggatgtt cattcttgct 600

gtccttgttc aacgctgggt aaatattaaa tttgctttcg atgtttctaa agttcaacta 660

gatgaaaagg cttatatcca ttgggataaa ttgccagaag ggtctaaagg tatccaagaa 720

gcattcgcac aagtaggaca aggattgtct caaactcctg aaaaagttac tactttccaa 780

caaaacttgg atatgttgat tcctggatta tcaggactac tccttacttt actttgcatg 840

tacttactta agaaaaaagt atctccaatc actattatcc ttgccctctt cgcagtgggt 900

attgtggcac atgttcttca catcatgtaa 930

<210> 458
<211> 831
<212> DNA
<213> Streptococcus pneumoniae

<400> 458
gccattattt atgaaaggat tttaaacatg tctattattt ctatggtttt agtagtcgtt 60

gtagccttct ttgcaggtct tgaaggcatc ctcgaccagt tccaatttca ccaaccactt 120

gtagcctgta cccttattgg gcttgtaaca ggtcacttgg aagcagggat tatcctcggt 180

ggatcgcttc aaatgattgc ccttggttgg tcaaatatcg gtgctgctat cgctcctgat 240

gctgcacttg cttctgtcgc tgctgccatt atcatggttc ttggtggtga ctttaccaag 300

actggtatcg gtgttgccca agcggttgct atcctcttg ctgtagctgg actttttcttg 360

acaatgattg ttcgtacaat ttcagttggt ttggttcata ctgcagatgc tgccgctaaa 420

aaaggtgact tcggcgctgt ggagcgtgcg catttcatcg cgctactttt ccaaggactt 480

cgtatcgcgc ttcctgcagc tcttctcctt atggtaccaa ctgaaactgt acaaagtatc 540

cttagtgcca tgccagactg gctcaaagat ggtatggcta tcggtggtgg tatggtcgtt 600

gccgttggtt acgccatggt tatcaacatg atggcaactc gtgaagtatg gccattcttc 660

gctcttggtt tcgttctcgc tgctgtgtca gatattactc taatcggatt cggtgctatc 720

ggcgttgcta tcgctcttat ctaccttcac ctttctaaaa ctggtggaaa tggtggcgga 780

ggagccgcaa cttctaacga cccaatcggc gatatcctag aagactacta a 831

<210> 459
<211> 1014
<212> DNA
<213> Streptococcus pneumoniae

<400> 459
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tttgctgcgg gtattcatca gtcaggatct atgatctttg gtgaacaaga aaaggttcaa 120

gttgtgacct ttatgccaaa tgaaggtcct gatgatctat acgctaagtt taataacgct 180

gttgctgcat ttgacgcaga agatgaggtt ctagttttgg ctgacctttg gagtggttct 240

ccatttaacc aagctagtcg cgtgatggga gaaaatcctg agcgtaagtt tgccatcatc 300

acaggactta acttaccgat gttgattcaa gcctacacag agcgcctcat ggacgctgct 360

gcaggtgtag aaaaagtcgc tgctaatatc attaaagaag ccaaagatgg catcaaagct 420

cttccagaag agctaaatcc agtcgaagaa gttgcaagcg ctgcagctgc tccagttgcc 480

caaactgcta tcccagaagg aactgttatc ggagacggta aattgaaaat caatcttgcc 540

cgtcttgaca cacgtctact tcacggtcag gttgcaactg cttggactcc agattcaaaa 600

gcaaatcgta tcatcgttgc ttcagataac gtggctaaag acgaccttcg taaagaattg 660

attaaacaag cagctccagg taatgtcaag gctaacgtgg ttccaattca aaaactgatt 720

gagatttcaa aagacccacg ttttggagaa acacatgccc ttatcttgtt tgaaacacct 780

caagatgccc ttcgtgccat cgaaggcggc gtgccaatca agactcttaa tgttggttct 840

atggctcact caacaggtaa aacattggtc aataccgttt tgtctatgga caaagaagac 900

gttgctacat ttgaaaaaat gcgtgacttg ggtgttgaat ttgatgtccg taaagtacca 960

aatgattcta aaaaagattt gtttgacttg attaacaaag ccaatgtcaa ataa 1014

<210> 460
<211> 1128
<212> DNA
<213> Streptococcus pneumoniae

<400> 460
tatacttcac atataaatac aagagagctc gtcacactcg actctgttga caaaaaatca 60

atccagtccc gttgtccctg ttctcggtca atatcaagga ggatagctat gaaagctgtt 120

gttgtaaatc cagaaagcac tggtgttgct attgaagaaa aagtactccg tccacttgaa 180

actggggaag cacttgtaga agttgaatac tgtggcgttt gccacaccga cctccacgtt 240

gctcatggtg actttggtca agtcccagga cgtgttcttg ggcacgaagg tatcggtatc 300

gttaaagaga ttgctccaga tgtgaaaagc cttaaagtcg gtgaccgcgt cagcgttgct 360

tggttctttg aaggatgtgg cacttgcgaa tactgtacaa ctggtcgcga aaccctttgc 420

cgtacagtga aaaatgctgg ctactcagta gacggtggta tggctgaaca atgtatcgta 480

actgctgact atgctgtcaa agttcctgac ggacttgatc cagcccaagc ttcttctatc 540

acatgtgctg gagtaacaac ctataaagct atcaaagaag caaaagttga accaggccaa 600

tgggttgttc tttacggtgc tggtggactt ggtaacctcg ctgttcaata cgctaaaaaa 660

gtattcaatg ctcatgttat cgcagtcgat atcaacaatg acaaacttgc ccttgcaaaa 720

gaagtaggcg ctgacattgt gattaacggc ctcgaagttg aagatgtagc tggactcatt 780

aaagaaaaaa ctgatggagg agctcattca gctgtcgtaa ctgctgtgtc taaagttgcc 840

ttcaaccagg ctgttgactc cattcgtgct ggtggtcgcg tcgtcgctgt tggtcttcct 900

tctgaaatga tggaactcag catcgttaaa acagtcctcg atggaatcca agtcatcggt 960

tctcttgtcg gaactcgtaa agacttagaa gaagccttcc aatttggtgc agaaggtctg 1020

gtagtcccag ttgttcaaaa acgtccagta gaagatgctg ttgccatttt cgacgaaatg 1080

gaaaaaggcc aaatccaagg acgtatggta ctcgacttca cccactaa 1128

<210> 461
<211> 477
<212> DNA
<213> Streptococcus pneumoniae

<400> 461
acaaaaatcg aactatatat aggagaaatc atgaacaaaa caacatttat ggctaaacca 60

ggccaagttg aacgtaaatg gtacgtagtt gacgcaactg atgtaccact tggacgtctt 120

tctgcagtag ttgctagcgt acttcgcgga aaaaacaaac caacatttac accacacact 180

gatacaggtg acttcgtgat tgttatcaat gctgaaaaag ttaaattgac tggtaaaaaa 240

gcaactgata aaatctacta cactcactca aaccacccag gtggattgaa acaaatctct 300

gcaggtgaac ttcgttctaa aaatgcagta cgtttgattg agaaatcagt taaaggtatg 360

cttccacaca atacacttgg acgcgctcaa ggtatgaagt tgaaagtatt tgttggagct 420

gagcacactc acgctgcaca acaaccagaa gttcttgaca tttcaggact tatctaa 477

<210> 462
<211> 396
<212> DNA
<213> Streptococcus pneumoniae

<400> 462
agtatgtcac aagcacaata tgcaggtact ggacgtcgta aaaacgctgt tgcacgcgtt 60

cgccttgttc caggaactgg taaaatcact gttaacaaaa aagatgttga agagtacatc 120

ccacacgctg accttcgtct tgtcatcaac caaccattcg cagttacttc aactgtaggt 180

tcatacgacg ttttcgttaa cgttataggt ggtggatacg ctggtcaatc aggagctatc 240

cgtcacggta tcgctcgtgc ccttcttcaa gtagacccag acttccgcga ttcattgaaa 300

cgcgcaggac ttcttacacg tgactcacgt aaagttgaac gtaagaaacc aggtcttaag 360

aaagctcgta aagcatcaca atttagtaaa cgttaa 396

<210> 463
<211> 834
<212> DNA
<213> Streptococcus pneumoniae

<400> 463
aggaggaagc acacgatgac tggatctaac aaattaacaa aacgtgatta tcttaaaacg 60

tctttgcggg cattcttttg tcaaaatgga tttaactata gtaactatca agggttggga 120

tatgccaatg tgatgtatcc tgctttgaaa aaacactatg gagaggatca ggaaggtttc 180

taccaagcct tggaagaaaa ctgtgaattc tataatacca acccacactt cctgcctttt 240

attaccagct tgcatcttgt aatgttggaa aatggccgtc cggcaaaaga aacacgtagc 300

atcaagatgg ccttgatggg accattggca ggtattgggg attctctttc tcaattctgt 360

ttagctccat tgttctcaac catcgcagct tcgtttgctc aagaaggctt ggttgtcggt 420

ccaatcttgt tcttccttgc gatgaatacg attttaacag cgattaaatt gtcaactggt 480

ctgtatggat acaaactagg aacaactgtg attgataaac taagcgaaca gatggcaacg 540

atttctcgta ttgccaatat tatcggtgta accgtaattg ctggtttggc agcgacatct 600

gttaagatta tggtgccgat tacctttgct gcaggggaag ttaaagcaga cgctaaacaa 660

agtatcgtaa gtattcaggg aatgcttgat aaggttgctc cagctcttct accagcccta 720

tttacacttt tagtttacta cttgatcaaa gaaaagaaat ggacaacata taaactcgtt 780

attttaacag ttatcatcgg aattatcgga agctggctta agattatagc ttaa 834

<210> 464
<211> 1533
<212> DNA
<213> Streptococcus pneumoniae

<400> 464
tttcctaact tccaattttt tattataata gagtccagag gtaaaaaaat gaaaaaacaa 60

gcttttagtt ctgaacaata tttgaattta caacgcgacc atattttgga gcgcattaac 120

caatttgacg gcaagctcta cttagagttt ggcggtaaaa tgttagaaga tttccacgct 180

gctcgtgtcc ttcctggtta tgaacctgac aacaaaatca agctcttgca agaattgaaa 240

gagcaggttg aggttgtgat tgccattaat gctagcaaca ttgaacattc caaagcacgt 300

ggcgacttag gcatttctta tgaccaagaa gttcttcgtt tgattgataa attcaatgaa 360

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gccttccgca atcaacttga gaaaaacgga attgattctt atcttcatta tccaatcaaa 480

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aaatttgaaa ccttccctgt ttggaatctt ccccttcatc atccagttaa cttggcttat 720

gaagctgcca cagctgacct tgatgatgtc aacatgattg acccccttcca tcttcaaacc 780

tatggagaaa ccactgtcaa ctacaaccgt gatatcgaaa tcttcccagt gctcaaacgc 840

atgttggaac gtattctcgg aaaatcacca tacgcttcac cgacagatat gggtgtcaac 900

atggttggtt tcgctattac agatgacgag gccgctgtcg aagcttctaa acaagaaatc 960

atccgccgtt actatcaaac agttcttgac ttcaaagctg aaaaagttgg cgaagctgcc 1020

gtcaagaaaa ttgagttgct catgaacgac ctcggtatca cacctgcaga ccgtaaggtt 1080

gctgtcgttg cgcgccaaaa agcagaagaa actggtggac cagccctagc ctttgaattg 1140

ccaaatgggg aaatcatcac tggtaagaac tcagaactct ttggtcctac agccgctgcc 1200

ttgatcaacg ccatcaaaaa atcagctgac atcgctaaag aagtaaaact aatcgagcct 1260

gaagttgtta agccaatcca aggtcttaaa atcgatcatc tcggtagccg caatccacgc 1320

cttcattcaa atgaaatcct gattgcactt gctatcacag ctacagaaaa tcctgatgct 1380

gcccgcgcta tggaagaact cggcaacctc aaaggaagcg aagcccactc aaccatcatc 1440

ttgactgatg aagacaagaa tgtccttcgt aaactgggta tcaacgtaac ctttgaccca 1500

tactaccaat acgaccgctt atatcgtaag taa 1533

<210> 465
<211> 2166
<212> DNA
<213> Streptococcus pneumoniae

<400> 465
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agcttggtta tcgcagccat tgtcttaggc ggaggagttt ttttctacta cgttagcaag 120

gctcctagcc tatccgagag taaactagtt gcaacaactt ctagtaaaat ctacgacaat 180

aaaaatcaac tcattgctga cttgggttct gaacgccgcg tcaatgccca agctaatgat 240

attcccacag atttggttaa ggcaatcgtt tctatcgaag accatcgctt cttcgaccac 300

agggggattg ataccatccg tatcctggga gctttcttgc gcaatctgca aagcaattcc 360

ctccaaggtg gatcaactct cacccaacag ttgattaagt tgacttactt ttcaacttcg 420

acttccgacc agactatttc tcgtaaggct caggaagctt ggttagcgat tcagttagaa 480

caaaaagcaa ccaagcaaga aatcttgacc tactatataa ataaggtcta catgtctaat 540

gggaactatg gaatgcagac agcagctcaa aactactatg gtaaagacct caataattta 600

agtttacctc agttagcctt gctggctgga atgcctcagg caccaaacca atatgacccc 660

tattcacatc cagaagcagc ccaagaccgc cgaaacttgg tcttatctga aatgaaaaat 720

caaggctaca tctctgctga acagtatgag aaagcagtca atacaccaat tactgatgga 780

ctacaaagtc tcaaatcagc aagtaattac cctgcttaca tggataatta cctcaaggaa 840

gtcatcaatc aagttgaaga agaaacaggc tataacctac tcacaactgg gatggatgtc 900

tacacaaatg tagaccaaga agctcaaaaa catctgtggg atatttacaa tacagacgaa 960

tacgttgcct atccagacga tgaattgcaa gtcgcttcta ccattgttga tgtttctaac 1020

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aaccaagcag tagaaacaaa ccgcgactgg ggatcaacta tgaaaccgat cacagactat 1140

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aaggtcggac tcaaccgcgc caagactttc ctaaatggtc taggaatcga ctacccaagt 1380

attcactact caaatgccat ttcaagtaac acaaccgaat cagacaaaaa atatggagca 1440

agtagtgaaa agatggctgc tgcttacgct gcctttgcaa atggtggaac ttactataaa 1500

ccaatgtata tccataaagt cgtctttagt gatgggagtg aaaaagagtt ctctaatgtc 1560

ggaactcgtg ccatgaagga aacgacagcc tatatgatga ccgacatgat gaaaacagtc 1620

ttgacttatg gaactggacg aaatgcctat cttgcttggc tccctcaggc tggtaaaaca 1680

ggaacctcta actatacaga cgaggaaatt gaaaaccaca tcaagacctc tcaatttgta 1740

gcacctgatg aactatttgc tggctatacg cgtaaatatt caatggctgt atggacaggc 1800

tattctaacc gtctgacacc acttgtaggc aatggcctta cggtcgctgc caaagtttac 1860

cgctctatga tgacctacct gtctgaagga agcaatccag aagattggaa tataccagag 1920

gggctctaca gaaatggaga attcgtattt aaaaatggtg ctcgttctac gtggaactca 1980

cctgctccac aacaaccccc atcaactgaa agttcaagct catcatcaga tagttcaact 2040

tcacagtcta gctcaaccac tccaagcaca aataatagta cgactaccaa tcctaacaat 2100

aatacgcaac aatcaaatac aacccctgat caacaaaatc agaatcctca accagcacaa 2160

ccataa 2166

<210> 466
<211> 351
<212> DNA
<213> Streptococcus pneumoniae

<400> 466
caagcgagaa tggagagaga catggcaagt attatttttt cagcgaaaga tattttgaa 60

caagagtttg gacgtgaggt ccgtggctat aataaagtag aagttgacga gtttttagac 120

gatgtcatca aggactatga aacctatgct gccttggtca agtcacttcg tcaggaaatt 180

gcggatttga aggaagaatt aactcgtaaa ccgaaacctt caccagttca agcagaaccc 240

cttgaagcgg caattacaag ttctatgacg aattttgata ttttgaaacg cctgaataga 300

ttggaaaaag aagtttttgg taaacaaatt ttagataact cagattttta a 351

<210> 467
<211> 1407
<212> DNA
<213> Streptococcus pneumoniae

<400> 467
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caatttgatt ttgatgaagc aaaagagcta acagttggtc aagctattcg taaaaatgaa 120

gaagtggaat caggagtctt gcctgaggat tccattttgg acaagtatgt taagcaacac 180

agagatgaaa ttgaggcgga taagtttgcg actcgtcaat acaaaaaaga ggagttcgtt 240

gaaactcaga gtctggatga tttaattcaa gagatgcgtg aggctgtaga gaagtcagaa 300

gcttcttcgg aggaagttcc atcttctgaa gacatcttac taccttgcc tctggacgat 360

gaggagcaag gcttggatcc tctattgcta gatgatgaaa atccaacaga aatgactgaa 420

gaagtggaag aggagcaaaa cctttctcgt ctggatcaag aggactcaga aaagaaaagt 480

aaaaaaggct ttattttgac cgttttggcg cttgtatcag taattatttg tgtcagtgct 540

tattatgtct accgtcaagt ggctcgttcg actaaggaaa ttgaaacttc tcaatcaact 600

acagccaatc aatcggatgt ggatgatttt aatacacttt atgacgcctt ttacacagat 660

agcaataaaa cggctttgaa aaatagccag tttgataaac tgagtcaact caagacttta 720

cttgataagc tggaaggtag tcgtgaacat acgcttgcca aatctaaata tgatagtcta 780

gcaacgcaaa tcaaggctat tcaagatgtc aatgctcaat ttgagaaacc agctattgtg 840

gatggtgtgt tggataccaa tgccaaagcc aaatcggatg ctaaatttac ggatattaaa 900

actggaaata cggagcttga taaagtgcta gataaggcta tcagtcttgg taagagccag 960

caaacaagta cttctagctc aagttcaagt caaactagca gctcaagttc aagtcaagca 1020

agttcaaata cgactagtga gccaaaacca agtagttcaa atgagactag aagtagtcgc 1080

agtgaagtca atatgggtct ctcgagtgca ggggttgctg ttcaaagaag tgccagtcgt 1140

gttgcctata atcagtctgc tattgatgat agtaataact ctgcctggga ttttgcggat 1200

ggtgtcttgg aacaaattct agcgacttca cgttcacgtg gctatatcac tggagaccaa 1260

tatatccttg aacgtgtcaa tatcgttaac ggcaatggtt attacaacct ctacaagcca 1320

gatggaacct atctctttac ccttaactgt aagacaggct actttgtcgg aaatggcgct 1380

ggtcatgcgg atgacttaga ttactaa 1407

<210> 468
<211> 1500
<212> DNA
<213> Streptococcus pneumoniae

<400> 468
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caagaggagt gtcaaatgac aaaagctaac tttggtgtcg taggtatggc cgtaatgggt 120

cgtaaccttg cccttaatat tgaatctcgt ggttacacag ttgctatcta caaccgtagt 180

aaagaaaaaa cggaagatgt gattgcttgc catcctgaaa agaactttgt accaagctat 240

gacgttgaaa gttttgtaaa ctcaatcgaa aaacctcgtc gtatcatgct gatggttcaa 300

gctggacctg gtacagatgc tactatccaa gcccttcttc cacaccttga caagggtgat 360

atcttgattg acggaggaaa tactttctac aaagatacca tccgtcgtaa tgaagaattg 420

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ggagacaagg ctgaattgat tgaaaagatc cgtcaagccc tttacttctc aaaaatcatt 1080

tcatacgcac aaggatttgc tcaattgcgt gtagcctcta aagaaaacaa ctggaacttg 1140

ccatttgcag atatcgcatc tatctggcgt gatggctgta tcatccgttc tcgtttcttg 1200

caaaagatta cagatgctta caaccgcgat gcagatcttg ccaaccttct tttggacgag 1260

tacttcttgg atgttactgc taagtaccaa caagcagtac gtgatatcgt agctcttgcg 1320

gttcaagcag gtgtgccagt gccaactttc tcagcagcta ttacttactt tgatagctac 1380

cgttcagctg accttccagc taacttgatc caagcacaac gtgactactt tggtgctcac 1440

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<210> 469
<211> 438
<212> DNA
<213> Streptococcus pneumoniae

<400> 469
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acgattgatg tcatcggtaa ggctccagac gtgactccaa gtcaagtgtc aaaagagttg 180

atggtaactc ttggaactgt tacgacaagt ttgaacaatt tagagcgtaa gggctacatt 240

gagcgagttc ggtcagaaca ggatcgtcgt gtggtgcatc tgcatttgac aaagaagggt 300

cgcttgattc atagactgca taaacgcttc cacaaggcca tggtagaaaa aattattgat 360

ggcatgagcg aggaagaaat tgctgtcatg ggtaaaggtt tgactaatct ttaccaattt 420

ttggaggatt tgaaataa 438

<210> 470
<211> 237
<212> DNA
<213> Streptococcus pneumoniae

<400> 470
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aaagacgcat cagaagtaac acttgaatca acttttgatg atttggacgc agattcattg 120

gacttgttcc aagtaatctc agaaatcgaa gatgcttttg atatccaaat cgaagcagaa 180

aatgacttga aaacagttgg tgacttggtt gcttacgttg aagagcaagc aaaataa 237

<210> 471
<211> 2343
<212> DNA
<213> Streptococcus pneumoniae

<400> 471
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aaagcttggg aaggcttcaa aggcgtagat tggaaagaaa aagcaagtgt atcacgattt 120

gtacaagcta actacacacc ttatgatgga gacgaaagct tccttgcagg accaacagag 180

cgttcacttc acatcaagaa aattgtagaa gaaactaaag cacactacga agaaactcgt 240

ttcccaatgg acactcgtcc aacatctatc gctgatatcc ctgctggatt tatcgacaaa 300

gaaaatgaag ttatcttcgg tatccaaaac gatgaactct tcaaattgaa cttcatgcca 360

aaaggtggta tccgtatggc tgaaactact ttgaaagaaa atggatacga accagaccca 420

gctgttcacg aaatcttcac taaatatgta acaacagtta acgacggtat tttccgtgcc 480

tacacttcaa atattcgtcg cgctcgtcac gcacacactg taactggtct tccagatgca 540

tactcacgcg gacgtatcat cggtgtttac gcacgtcttg ctctttacgg tgcagactac 600

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cgtcttcgtg aagaagtaaa ccttcaatac caagcattgc aacaagttgt tcgcctgggt 720

gacctttacg gggttgatgt tcgcaaacca gcgatgaacg tgaaagaagc aatccaatgg 780

gttaacattg ctttcatggc tgtctgccgt gtgattaacg gtgctgctac atctctaggt 840

cgtgtaccaa tcgtattgga catctttgca gaacgtgacc ttgctcgtgg tacatttact 900

gaatcagaaa tccaagaatt cgttgatgat ttcgttatga aacttcgtac agttaaattt 960

gctcgtacaa aagcttatga ccaattgtac tcaggtgacc caacctttat cacaacttct 1020

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aacactcttg acaacatcgg taactcacca gaaccaaact tgacagttct ttggactgac 1140

aaattgccat acaacttccg tcgctactgt atgcacatga gccacaaaca ctctttctatc 1200

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ggtgctcgtg taaacgttct taaagccctt cttactggtt tgaatggtgg ttacgacgat 1380

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gccttgaaca tcatccacta catgactgat aggtacaact acgaagctgt tcaaatggcc 1560

ttcttgccaa ctaaacaacg tgccaacatg ggattcggta tctgtggatt tgctaacact 1620

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taa 2343

<210> 472
<211> 1620
<212> DNA

<213> Streptococcus pneumoniae

<400> 472

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accattcaaa agtttgaccc ttatatcaat attgatccgg gaaccatgag tccttaccag 180

cacggggaag tttttgtgac agatgacgga gctgagacag atttggactt gggtcactat 240

gaacgtttca tcgatatcaa tctcaacaaa tattccaacg tgacaactgg gaaaatttac 300

agtgaagttc ttcgtaaaga acgccgtgga gaataccttg gggcaactgt tcaagtcatt 360

cctcatatca cagatgcttt gaaagaaaaa atcaagcgtg ccgctctaac gaccgactct 420

gatgtcatta tcacagaggt tggtggaaca gtaggagata tcgagtcctt gccattccta 480

gaggctcttc gtcagatgaa ggcagatgtg ggtgcggata atgtcatgta tatccataca 540

accttgcttc cttacctcaa ggctgctggt gaaatgaaaa ccaaaccaac ccaacactct 600

gtcaaagaat tgcgtggctt gggaatccaa ccaaatatgt tggttattcg tacagaagag 660

ccagctggtc aaggaattaa aaataaactg gcccagttct gtgatgtggc accagaagcc 720

gttatcgaat cgttggatgt tgaacacctt taccaaattc cactgaactt gcaggcacaa 780

gggatggacc aaattgtttg tgatcatttg aaattagacg caccagcagc ggatatgaca 840

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gttggtaagt atgtggagtt gcaagatgcc tatatctcag tggtcgaagc cttgaaacac 960

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ggtcaacgtg gtacagaagg gaaaatccaa gccatccgct atgcgcgtga aaatgatgtt 1140

ccaatgttgg gagtctgctt gggaatgcag ttgacatgta tcgagtttgc tcgtcacgtt 1200

ttaggtcttg aaggtgccaa ttctgcagag cttgcaccag aaacaaaata ccctatcatt 1260

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gtgcaacgcc gtcaccgtca ccgttatgag tttaataatg ccttccgtga gcagtttgag 1440

gcagcaggtt ttgtcttttc aggagtttct ccagacaatc gtttggtaga aatcgtggaa 1500

attcctgaaa ataaattctt tgtagcttgt cagtatcacc ctgaactgtc aagccgtcca 1560

aaccgaccag aagaactcta cactgccttt gttactgcag cagttgagaa cagcaattag 1620

<210> 473
<211> 1140
<212> DNA
<213> Streptococcus pneumoniae

<400> 473
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gaaatcaaaa aggcttatcg taagctttcc aaaaaatatc acccagatat caacaaggag 120

cctggtgctg aggacaagta caaggaagtt caagaagcct atgagacttt gagtgacgac 180

caaaaacgtg ctgcctatga ccagtatggt gctgcaggcg ccaatggtgg ttttggtgga 240

gctggtggtt tcggcggttt caatggggca ggtggcttcg gtggttttga ggatattttc 300

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gatctccagt atcgtgtcaa tttgaccttt gaagaagcta tcttcggaac tgagaaggaa 420

gttaagtatc atcgtgaagc tggctgtcgt acatgtaatg gatctggtgc taagccaggg 480

acaagtccag tcacttgtgg acgctgtcat ggcgctggtg tcattaacgt cgatacgcag 540

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gctagcgaca agtttgaacg tgaaggaacg actatcttct acaatctcaa cctcaacttt 840

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gttattccag agggaactca gactggtaag aagttccgcc tacgtagtaa gggggcaccg 960

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ggcttgaacg accgccaaaa agtagccttg aaagaattcg cggctgctgg tgacttgaaa 1080

gtaaatccaa agaaaaaagg cttctttgac catattaaag atgcctttga tggagaataa 1140

<210> 474
<211> 297
<212> DNA
<213> Streptococcus pneumoniae

<400> 474
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ctggttacaa aaaatcgcca aaccatcaca gatgaagtct tgaataccac tgaccgcgtt 120

caagctatca aggacgatgt ggatattatc caaaacagcc tgcaaatcat taaccagcaa 180

aaagaactta tcaaggaata ccaagaagac ttgacttaca agtttaaggt cttggaaaag 240

gatatccaga ctagactagc tgtgataaaa gaaatgcagg gaactgaaga taagtaa 297

<210> 475
<211> 1158
<212> DNA
<213> Streptococcus pneumoniae

<400> 475
ggattcaaaa gtgaagaaaa catgagtaaa gaaatgctag aggccttccg cattttggaa 60

gaagacaagg gaatcaaaaa agaagatatc atcgacgcag tagtagagtc gcttcgttcc 120

gcttatcgca gacgctatgg tcagtcagac agcgtagcta ttgacttcaa cgaaaaaaca 180

ggtgacttta cagtttatac tgtccgtgaa gttgttgatg aagtatttga tagccgtttg 240

gaaatcagct tgaaagatgc tcttgccatt aattcagctt atgaacttgg agacaaaatc 300

aagtttgaag aagcaccagc tgagtttggt cgtgtagcag cccaatctgc caaacaaacc 360

atcatggaaa aaatgcgcaa gcaaacacgt gccatcactt acaatactta caaagaacat 420

gagcaagaaa tcatgtctgg tacagtagaa cgctttgaca accgctttat ctatgtcaac 480

cttggtagca tcgaagccca attgtcaaaa caagaccaaa ttcctggaga agtttttgct 540

tctcatgatc gtatcgaagt ttatgtttac aaggttgaag acaaccctcg tggtgtgaac 600

gtctttgtta gccgtagtca tccagaaatg atcaaacgtt taatggagca agaaattcca 660

gaagtttatg atggaactgt tgaaatcatg agcgtggctc gtgaagcagg tgaccgtacg 720

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gctgaattta tctacaatgc catcgctcct gctgaggttg accaagttat ctttgatgaa 960

aacgacagca aacgtgcctt ggtggttgtt ccagataaca agctttctct tgccattggt 1020

cgtcgtggac aaaacgtgcg cttggcggct cacttgactg gttaccgtat cgatatcaag 1080

tctgctagcg aatttgaagc catggaagac gctgcttcag tagagttgga agtagaaaac 1140

gatactgtag aagaataa 1158

<210> 476
<211> 2910
<212> DNA
<213> Streptococcus pneumoniae

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gcaaaagaac ttggaaaaga aagtaaagaa gttgtagcgc gtgcaaaaga gttgggcttg 120

gatgtgaaaa gccactcatc aagtgtggaa gaagctgtcg ctgcaaaaat tgctgccagc 180

tttaagcctg cagctgctcc gaaagtagaa gcaaaacctg cagccccaaa agtaagtgca 240

gaaaagaaag ccgaaaaatc tgagccagct aaaccagctg tagctaagga agaggcaaaa 300

cctgcagccc caaaagcaag tgcagaaaag aaagccgaaa agtctgaacc agtaaaacca 360

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gcggctaaac cgcaaagtcg taatttcaag gctgagcgtg aagcacgtgc taaagagcag 480

gcagagcgac gcaagcaaaa taagggcaat aaccgtgacc aacaacaaaa cggaaaccgt 540

cagaaaaacg acggccgtaa tggtggaaaa caaggtcaaa gcaaccgcga caatcgtcgc 600

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caagaggata aacgttcaaa tcaagcggct ccacgtattg actttaaagc ccgtgcagca 720

gccctaaaag cagagcaaaa tgcagagtac gctcgttcaa gtgaggaacg cttcaagcag 780

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aaaaaaggca ataacaagaa caaccgtaat cagactccaa aacctgttac ggagcgtaaa 1140

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ggtgaagcag gtggtattac tcagcatatc ggtgcctacc aaatcgtgga aaatggtaag 1560

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cgtgaaggtg gattgatgat cgacggctac aatgatatta agatggatga tgtgattgag 2880

gcgtatgtca tggaagaaat caagagataa 2910

<210> 477
<211> 912
<212> DNA

<213> Streptococcus pneumoniae

<400> 477
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caagcagccc gtgacaacgg ttatgcagtt ggtggattta acacaaacaa ccttgagtgg 120

actcaagcta tcttgcgcgc agcagaagct aaaaaagctc cagttttgat ccaaacttca 180

atgggtgctg ctaaatacat gggtggttac aaagttgctc gcaacttgat cgctaacctt 240

gttgaatcaa tgggtatcac tgtaccagta gctatccacc ttgaccacgg tcactacgaa 300

gatgcacttg agtgtatcga agttggttat acttcaatca tgtttgacgg ttcacacctt 360

ccagttgaag aaaaccttaa attggctaaa gaagttgttg aaaaagcaca cgctaaaggt 420

atctcagtag aagctgaagt tggtactatc ggtggtgaag aagatggaat catcggtaaa 480

ggtgaattgg ctccaatcga agacgctaaa gcaatggttg aaactggtat cgacttcttg 540

gcagctggta tcggtaacat ccacggtcct tacccagtaa actgggaagg tcttgacctt 600

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tcaggtattc ctgatgagca aatccaagca gctatcaaac ttggtgttgc caaagttaac 720

gttaacacag aatgccaaat cgcattcgct aacgcaactc gtaaatttgc tcgtgactac 780

gaagcaaacg aagcagaata cgacaagaaa aaactcttcg acccacgtaa attcttggct 840

gacggtgtaa aagctatcca agcatcggtt gaagaacgta tcgacgtatt cggttcagaa 900

ggtaaagcat aa 912

<210> 478
<211> 468
<212> DNA
<213> Streptococcus pneumoniae

<400> 478
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gctcttggtc aagctggtat caacatcatg ggattcacaa aagagttcaa cgctcgtaca 180

gctgaccaag ctggtatgat cattccagtt gttatctcag tttacgaaga taaatcattt 240

actttcgtta cgaaaacacc accagctgct gttcttttga aaaaagctgc aggtgttgaa 300

aaaggatcag gtacacctaa taaaactaaa gttgctacag ttactcgtgc acaagtacaa 360

gaaattgcag aaactaagat gccagatttg aacgcagcaa acgtagagtc tgcaatgcgt 420

atgatcgaag gtactgctcg ttctatggga ttcactgttg ttgactaa 468

<210> 479
<211> 693
<212> DNA
<213> Streptococcus pneumoniae

<400> 479
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gcatacagtg tagaagaagc tgtagcactt gcaaaagaaa ctaactttgc aaaatttgat 120

gcaactgtag aagttgctta caacttgaac atcgacgtta aaaaagctga ccaacaaatc 180

cgtggagcaa tggtattgcc aaacggtact ggtaaaactt cacgtgttct tgttttcgca 240

cgtggtgcaa aagctgaaga agcaaaagct gctggtgcag actttgttgg tgaagatgac 300

cttgttgcta aaatcaacga cggttggttg gacttcgacg tagttatcgc tacacctgat 360

atgatggctc ttgttggacg tcttggacgt gtccttggac cacgtaactt gatgccaaac 420

cctaaaactg gtactgtaac aatggatgtt gctaaagcag ttgaagagtc taaaggtggt 480

aaaatcactt accgtgctga ccgtgcaggt aacgttcaag caatcatcgg taaagtatca 540

tttgaagctg aaaaattggt tgaaaacttt aaagctttca acgaaacaat ccaaaaagca 600

aaaccagcta cagctaaagg aacttacgta acaaacttga ctatcacaac tactcaaggt 660

gttggtatca aagttgacgt aaactcactt taa 693

<210> 480
<211> 1866
<212> DNA
<213> Streptococcus pneumoniae

<400> 480
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attatcgccc acgttgacca cggtaaaaca accctggttg acgaattatt gaaacaatca 120

gaaacgcttg atgcacggac tgaattggca gagcgtgcta tggactcaaa cgatatcgaa 180

aaagagcgtg gaattaccat ccttgctaaa aatactgccg ttgcttacaa cggaactcgt 240

atcaacatta tggacacacc aggacacgcg gactttggtg gagaagttga gcgtatcatg 300

aaaatggttg acggtgttgt cttggtcgta gatgcctatg aaggaaccat gccacaaact 360

cgtttcgtat tgaaaaaagc cttggaacaa gaccttgtcc caatcgtggt tgttaacaaa 420

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gagcttggtg cagatgacga ccagcttgat ttcccagtgg tttatgcttc agcgatcaac 540

ggaacttctt cattgtcaga tgatccagct gaccaagaag cgactatggc accaatcttt 600

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caagtgtcac ttttggacta caatgacttc gttggacgta tcggtatcgg tcgtgtcttc 720

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gccaaagcgg gtgacttgat tgccgtttca ggtatggaag acatctttgt cggtgaaacc 900

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gacccaactg attcaccaga taaatggact gtttcaggac gtggagaatt gcacttgtca 1140

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tctcttgagt tcttgaacga cgatgagtac atggaagtaa cgcctgagtc tatccgtttg 1800

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gaataa 1866

<210> 481
<211> 1200
<212> DNA
<213> Streptococcus pneumoniae

<400> 481
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ttggagccaa tggcgcaaca agttattcct aaagcagcat ttggctatat cgctagtggg 180

gcggaagata ctttcacttt aagagagaat atccgtgcct ttaaccacaa gctcatcgtt 240

cctcatacac tttgcaatgt agaaaatcca agtacagaga ttgaatttgc aggtgaaaaa 300

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gatgtagaat ttatcgctga atactctggt cttcctgtgt atgtcaaggg accacaatgc 780

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aagacagtta tgcaattgtc tggaactcag accattgaag atgtcaaaca cttcaagctc 1140

cgtcacaatc catacaaccc aaccttccca gttgaccctc gtgacttaaa attgtattga 1200

<210> 482
<211> 1011
<212> DNA
<213> Streptococcus pneumoniae

<400> 482
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atcgacatgt cagaaccatt atttttacaa tcagttatgc aagaaaaaat ctggggtgga 120

gccaagctac gtgatgagtt tggctacgac atcccaagtg aaaaaatcgg agaatattgg 180

gccatctcag cccatccaaa tggagtctct aaagttgcca atggtcgtta cgagggaaca 240

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gacgatgctt atggactcga gcatgaaggc gaactcggaa aaacagaatg ctggtacatt 420

atcgcagcgg atgaaggttc agagattatc tacggtcaca atgccaagtc aaaagaagaa 480

ctccgccagc aaatcgagga caagaactgg gatgacttgt tgaccaaagt ccctgttaag 540

gctggagatt tcttctatgt accaagcggg actatgcacg ctatcggggc gggtatctta 600

atccttgaaa cccagcagtc tagcgatacc acctatcgcg tctatgactt tgaccgcaag 660

gatgacaaag gcaacttgcg tgaacttcat cttgaaaaat ccatcgatgt cttgaacatt 720

ggtgagccag caaatagccg tcctgtaact gttaaagcag atgatttgcg ttccactctc 780

cttgtatcta atgatttctt cgcagtttac aagtgggaaa ttactggaaa agttgacttt 840

gaaaagacag ctgactacag cttattgagt gtcttggctg gtcaaggtca gctaactgtt 900

gacgggaaaa attatccaat tcaaaaaggc agccacttta tcctaccaag tgatgttgaa 960

gcttggactc tggaagggca aggtttggaa ttgattgtta gccatccata a 1011

<210> 483
<211> 864
<212> DNA
<213> Streptococcus pneumoniae

<400> 483
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caactgccaa caccagctat taacacaacc tttgtaagtg tcccctaac cattcaagta 120

gctgatcagg tctttgttga tgacgccagt ctcgatattg accaaatgat ggaaaccatg 180

tatgcaactg cagaagcttc aaaatcggct tgtccaagcc cagatgacta tttgcgagca 240

tttgaaggtg ccaaaaacat tttcctagta accatcacag gtacccttc tggcagtcac 300

aatagtgctc aactagcaaa gaatatttat ctggaagacc atcctgacac taagattcat 360

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gaaactggga ctctcgaatt gctacaaaaa gcaaggggat caaagaaatc agttcaagct 660

gcctatgatg agttagtaaa agctggatat gctggtggcc gtattgtcat ggcccaacgc 720

aataacgaaa aatgttgtca acagctctca gagcgaatcc gtgaaaactt cccacaagcg 780

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ctgatgggct atgaaattga ttaa 864

<210> 484
<211> 681
<212> DNA
<213> Streptococcus pneumoniae

<400> 484
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acttctacaa aagcttttcg tgagctagta gatgagattg caatgttgat ggggtatgaa 180

gtacttcgtg atcttccact agaagatgtg gaaatcgaaa caccaattac aaaaacagtt 240

caaaaacaat tggcaggtaa gaaattggcc atcgtcccaa tcttgcgtgc aggtatcggg 300

atggttgatg gtctcttgaa cttggttcca gctgctaaag ttggccacat cggtatgtac 360

cgtgatgaag aaacacttca accagttgaa tacttggtga aattgcctga ggacattgac 420

caacgtcaaa tttttgtagt agacccaatg ttggcaacag gtggctcagc aatcttggct 480

gttgattctc ttaaaaaacg tggcgcatca aatatcaaat ttgtctgcct tgtatctgct 540

ccagagggtg taaaagccct tcaagaagct catccagatg tagaaatctt tacagcagcc 600

ttggatgaac gtttgaacga acacggttat atcgttccag gtcttggaga tgctggagac 660

cgcttgttcg gtacaaaata a 681

<210> 485
<211> 951
<212> DNA
<213> Streptococcus pneumoniae

<400> 485
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tctgaaacag ctgaggctgc ttcagttaca actaaccttg taacccaatc taaagtatca 120

gcagtcgtag gacctgcgac atctggtgcg actgcagctg cggtagcgaa cgctacaaaa 180

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gatgctatcg ttgttcctgg ttactataat gaggctggta aaattgtaaa ccaagcgcgt 540

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caacaagcaa ctgctgaaaa agcatcaaac atctacttta tctcaggctt ctcaactact 660

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aaaggtgcta aaaattcagg tgaaatcaag aataaccttg ctaaaacaaa agattttgaa 840

ggtgtaactg gtcaaacaag cttcgatgca gaccacaaca cagtcaaaac tgcttacatg 900

atgaccatga acaatggtaa agttgaagca gcagaagttg taaaaccata a 951

<210> 486
<211> 1218
<212> DNA
<213> Streptococcus pneumoniae

<400> 486
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gtatctgagg ggcatccgga taagattgca gaccaaattt cagatgcgat tttggatgct 120

attttagcaa aggatccaga ggcgcacgtt gctgctgaaa cagctgtata tactggttct 180

gtccacgttt ttggtgaaat ttctacaaat gcctatgtgg atattaaccg tgtggttcgt 240

gataccattg cagagattgg ttataccaat acagaatatg gattttctgc tgagacggtg 300

ggagtacacc catctttggt ggaacaatct cctgacatcg ctcaaggtgt taacgaagcc 360

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gggctcatgt ttggatttgc agtagatgaa acagaagagc ttatgccatt gccaattgca 480

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cgtgtagata cagtcgttat ttctactcag catgatccag aggccactaa tgaacaaatc 660

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tcaggtttga ctggtcgtaa gattattgta gatacttatg gtggctactc tcgtcatggt 840

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cacatgggac gtacagatat tgatcttcca tgggaacgtt tggataaggt agatgctttg 1200

aaagaagcag taaaataa 1218

<210> 487
<211> 291
<212> DNA
<213> Streptococcus pneumoniae

<400> 487
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aaacctttct accgtatcaa cgtagcagat tcacgttcac cacgtgacgg acgtttcatc 120

gaaacagttg gaacttacaa cccacttgtt gctgaaaacc aagtaacttt gaaagaagac 180

cgcgttcttg catggttggc taatggagct caaccttcag acacagtacg taacatcctt 240

tcaaaagaag gcgtattgaa aaaattccac gattctaaat tttcaaaata a 291

<210> 488
<211> 414
<212> DNA
<213> Streptococcus pneumoniae

<400> 488
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ataaaggaga aacctatgca agtaatcaaa cgtaatggcg aaattgctga atttaatcca 120

gataagattt accaagccat cttgaaggca gcccaaactg tttatgtttt gacagatgat 180

ttgcgtcaaa atcttgctca agtcactaag aaggtagttt tggatttaca agaagccaag 240

gtggaacgtg cgactatcag tatgattcaa tctatggttg aacatcgttt attgggcgca 300

ggttacatta ccattgcaga acactacatt tcctatcgtt tacaacgtga cttggaaaga 360

agtggttatg gagatcatat cgcagttcat ttacattttg aacaaattcg ctaa 414

<210> 489
<211> 2268
<212> DNA
<213> Streptococcus pneumoniae

<400> 489
ggtagatgta tgctttgtca aaactgtaaa attaacgact caacaattca tctttacacc 60

aatctcaatg gaaaacaaaa acaaattgac ctctgtcaaa actgctataa gattatcaaa 120

acagatccta acaatagcct cttcaaaggt atgacggatc tgaacaatcg tgacttcgat 180

ccctttggtg atttcttcaa tgatctaaac aatttcagac cttctagcaa tactcctcct 240

attcccccaa cccaatcagg tggaggttac ggtggaaacg gcggttatgg ttcccaaaat 300

cgtggatctg ctcaaactcc gccacctagc caagaaaaag gcctgctgga agaatttggt 360

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ggtgaacctg gtgtcggaaa aacggccgtt gtcgaaggtc tagctcagaa aattgtcgat 540

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attcgcaaac gtgaagacat catcctcttt atcgatgaaa tccatgaaat tgttggtgct 720

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gtaactgata aggtcaagga aaagttggtt gacctaggtt atgatccaaa aatgggagca 2100

cgcccacttc gtcggactat tcaagactat attgaggaca caatcactga ctactacctt 2160

gaaaatccaa gcgaaaaaga tctcaaagca gttatgacta gcaagggaaa cattcagatt 2220

aaatctgcca aaaaagctga agttaaaagt tctgaaaaag aaaaataa 2268

<210> 490
<211> 1203
<212> DNA
<213> Streptococcus pneumoniae

<400> 490
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gttgaaggtg tcttgactct tcgcgaattg acaaacgatc gtgatgcaga tatcaatgac 180

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ggactttcag tagaatttga aggtgttcgt ggatttatcc cagcttcaat gttggatact 420

cgtttcgtac gtaacgctga gcgttttgta ggtcaagaat ttgatactaa aatcaaagaa 480

gttaacgcta aagaaaaccg cttcatcctt tcacgtcgtg aagttgttga agcagctact 540

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gaagaaattg aagtgaaaat ccttgatctt aacgaagaag aaggacgtgt atcactttca 780

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gaacttccag aaacacaaac aggattttca atggctgatt tgtttggtga tatcgaactt 1200

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<210> 491
<211> 1443
<212> DNA
<213> Streptococcus pneumoniae

<400> 491
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ggaaaaggac tcaacgaagg tgttattcgt gaattatctg ctgctaaggg tgagcctgag 180

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gacaaaccag cccgttcttg ggatgatgta cctgaaaaga ttaaagaaac ctttgaacgt 360

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gaagtggttt accacaacat gaaggaagag ttccaaaaat taggtattat ctttacagat 480

acagattccg cactcaagga atacccagac ttatttaaac aatactttgc gaagttggta 540

ccgccgacag ataacaagtt ggcagccctc aactcagcag tatggtcggg tggaactttt 600

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tcagatacta ttccatttaa tgaaattcac aactcgcaag tggctttgga acacgaagcc 1260

aaagtatcta agatttcaga agagcaattg tattatctca tgagccgtgg attgtcagaa 1320

tctgaggcaa ctgaaatgat tgtcatggga tttgtagaac cctttacaaa agaacttcca 1380

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taa 1443

<210> 492
<211> 1254
<212> DNA
<213> Streptococcus pneumoniae

<400> 492
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gcaaatactg gtaaaattct ctatgagaag gatgcaacgc aacctgtcga aattgcttcc 180

ataacaaaat tgattactgt ttatctggtc tatgaagctt tggaaaacgg aagtattacc 240

ctctccactc ctgtagatat ttctgattat ccttatcaat tgacgacaaa ttctgaagcc 300

agtaatattc ctatggaggc ccgtaattat actgtcgaag agttgcttga agcaactctg 360

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gatttcgtcg atatgatgcg ggcaaaactc ttggaatggg gaattcagga tgccactgtt 480

gtcaatacga caggtcttaa caatgaaact ctaggggata acatttaccc aggttctaaa 540

aaagatgagg aaaataagct tagtgcttat gatgtcgcta tcgttgctcg caacctcatc 600

aaaaaatacc cacaagtctt agaaatcacc aaaaaacctt cttctacttt tgctgggatg 660

acaatcactt caaccaacta catgttagaa ggtatgcctg cttaccgtgg tggttttgat 720

gggctaaaaa caggaacaac agataaggct ggagagtctt ttgttggtac tactgtcgaa 780

aaaggcatga gagtcatcac agttgtttta aatgcagatc atcaagacaa taatccttac 840

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aaaatcgttc aacaaggcga tgcctatcaa gatagcaaag cccctgtaca agatggaaaa 960

gaagatacag taactgcagt ggctccagag gatatctatc taatcgaacg tgttgggaat 1020

caatcttccc aatctgttca attcacacct gattccaaag caatcccagc accacttgaa 1080

gctggaacag tggttggcca tttgacttat gaagacaagg acttgattgg tcaaggttac 1140

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ttcttaaaag tttggtggaa tcagtttgtc cgctttgtta acgagaaatt ataa 1254

<210> 493
<211> 1074
<212> DNA
<213> Streptococcus pneumoniae

<400> 493
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accaatatga aacgtattgc tgttttgact agtggtggag acgcccctgg tatgaacgct 120

gccatccgtg cagttgttcg tcaagcaatt tcagaaggaa tggaagtttt tggtatctat 180

gacggatatg ctggtatggt tgccggtgaa attcatcccc tagatgcagc ttcagtaggg 240

gacatcattt ctcgtggtgg tactttcctt cactcagctc gttacccaga gttcgctcaa 300

cttgaagggc aacttaaagg gattgagcaa ttgaaaaaac acggaattga aggtgtagtt 360

gttatcggtg gtgacggatc ttaccacggc gctatgcgtt tgactgaaca tggcttccca 420

gctattggtc ttccaggtac aatcgataac gatatcgttg gtactgactt tacaatcggt 480

tttgacacag cggttactac tgccatggac gctatcgata agattcgtga tacatcatca 540

agtcaccgtc gtacttttgt aatcgaagtt atgggacgta acgctggtga tatcgctctt 600

tgggctggta ttgcaactgg tgctgatgaa atcatcatcc ctgaagcagg cttcaagatg 660

gaagatatcg tagcaagcat caaagctggt tatgaatgtg gtaaaaaaca caatattatc 720

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gatacaagcg accttcgtgt aacagaactt ggacatattc aacgtggtgg ttctccaact 840

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ggagaatata ttcagcccga gttagtgctg tctccgcaag aagccttcta ttcagaaaga 1260

aaaagtttaa ctttggatga ttctgttgga caggtctgtg gagaatttgt tatgtgttac 1320

cctccaggta ttcctatctt ggctcctggt gaacgcatta cacgagaaat tgtcgactat 1380

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catatcaacg ttattaagag aaagacaaac tataagaaaa gtcaatag 1488

<210> 496
<211> 861
<212> DNA
<213> Streptococcus pneumoniae

<400> 496
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aagcaacttt acgctggaaa aagtgaatgg caggatatcg aagtcttgga tacgccagct 120

tttgggaaaa tactgatttt aaatggccat gtcttgttct cagatgcgga tgatttcgtc 180

tacaatgaaa tgaccgttca cgttcccatg gctgtccacc caaatccaaa gaaagtattg 240

gttattgggg gtggtgacgg cggtgttgcc caagtattaa ccctctatcc tgaactggag 300

caaattgata ttgtggaacc ggatgagatg ttggtcgagg tctgtcgtga gtatttccca 360

gactttgctg cagggctaga tgatcctcgt gttaccattt actaccaaaa tgggctacgc 420

tttttgcgaa actgcgaaga tgattacgat attatcatca acgatgcgac agatccattt 480

ggccatacgg aaggactctt taccaaggaa ttctacggca atagttatcg agctctgaag 540

gaagacggca tcatgattta ccagcatggg agtcccttct ttgacgagga tgagtcggcc 600

tgccgaagca tgcaccgcaa ggtcaatcaa gcctttccaa tcagtcgggt ttatcaggcc 660

catattccaa ctagcccagc tggctattgg ttgtttggat ttgcatcgaa aaaataccac 720

cctgtcaaag attttgacaa ggaaggctgg aaaaaacgcc agcttttcac agaatactac 780

actgcaaact tacacgtggg agcctttatg ttgcccaagt atgttgagga cattttagaa 840

gaagaggaag gaaaaaaatg a 861

<210> 497
<211> 885
<212> DNA

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ggtatcggtg gtgttgcggt tggtattcgt aacgaaaaaa tggttgaaaa tccaattctt 960

ggtactgcag aagaaggggc attgtttagc cttactgcag aaggtaagat tgtggttaac 1020

aacccacaca aagccgatat tgagctatct agcttgaata agagcttgtc ataa 1074

<210> 494
<211> 1545
<212> DNA
<213> Streptococcus pneumoniae

<400> 494
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gttgcaactt tgggtcctgc ggtagaaatc cgtggtggta aaaaattcgg tgaggacgga 120

tactggggtg aaaaacttga tgttgaagct tcagctaaaa acattgctaa attgattgaa 180

gctggtgcta acacattccg attcaacttc tcacacggcg accaccaaga acaaggtgag 240

cgtatggcaa ctgttaaact tgcggaaaaa attgcaggta aaaaagttgg tttccttctt 300

gatacaaaag gacctgaaat ccgtacagaa ttgttcgaag gtgaagctaa agaatattca 360

tacaaaactg gtgaaaaaat tcgtgttgca actaaacaag gaatcaaatc aactcgtgaa 420

gtgattgcgt tgaacgttgc tggtgctctt gatatctatg atgatgttga agttggtcgt 480

caagttttgg ttgacgatgg taaacttggt cttcgtgtgg ttgctaaaga tgatgcaact 540

cgtgaatttg aagttgaagt tgaaaacgat ggtatcatcg ctaaacaaaa aggtgtgaac 600

atccctaaca ctaaaattcc tttcccagct cttgctgaac gcgataacga cgatatccgt 660

ttcggtcttg aacaaggtat caacttcatc gcaatttcat tcgtacgtac tgcaaaagat 720

gtgaacgaag ttcgtgcaat ctgtgaagaa actggaaacg gacatgttca attgttcgct 780

aaaatcgaaa accaacaagg tatcgataac ttagatgaaa tcatcgaagc agctgatggt 840

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caaaaaatga ttatcaagaa agtcaatgct gcaggtaaag ttgttatcac tgcaacaaac 960

atgcttgaaa caatgactga aaaaccacgt gcaactcgtt cagaagtatc agatgtattc 1020

aacgctgtta tcgacggaac tgacgctaca atgttgtcag gcgagtctgc aaacggtaaa 1080

tacccactcg agtcagtaac tacaatggct acaatcgaca agaacgctca agctcttctt 1140

aatgaatacg gacgtcttga ttcagattca tttgagcgta actctaagac agaagtaatg 1200

gcttctgctg ttaaagatgc tactagctca atggatatca aattggttgt aactcttact 1260

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ttgacatttg acgaattgac agaacgtggc ttgatgttga actggggtgt tatcccaatg 1380

ttgacagatg ctccatcttc aactgacgat atgttcgaaa tcgctgaacg taaagcggta 1440

gaagcaggtc tcgttgagtc aggcgatgat atcgttatcg ttgctggtgt gccagtagga 1500

gaagctgttc gcacaaacac aatgcgtatc cgcacagtac gttaa 1545

<210> 495
<211> 1488
<212> DNA
<213> Streptococcus pneumoniae

<400> 495
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aagttacgca agaaaaggat tgttcccttt gatgttccag gtcacaagcg tggacgggga 120

aatccagaac ttgtcgaact cttaggagaa aaatgtgtag gcattgatgt caattcgatg 180

aaacctttgg ataatttagg ccatcctatt tcgattattc gtgatgcaga ggagctggct 240

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agtgtagatc ctaagattgg tatcgcttta ggtcttgaaa atgaccgagt agcacaggcc 480

ataaaggacc atccagatgc taaggctatc ctaatcaaca atcctactta ctacggcatc 540

tgttcagacc taaaggggtt gacagaaatg gctcatgaag ctggcatgat ggttttagta 600

gatgaagccc acggagcgca tttgcatttc actgataaac ttccaatttc tgctatggat 660

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tccatttttac ttatcgggga gcagatgaat tctgaatacg ttcgtcagat aattaacctg 780

acccagtcta catctgcctc ttacttgttg atggctagtt tggatatttc acgtcgcaac 840

ttggcccttc gtggtaaaga gtcgtttgag aaagtcattg agctatctga gtatgcccgc 900

cgtgaaatca atgctatcgg tggctactat gcctactcaa aagagttaat agacggtgtt 960

tcggtttgcg attttgacgt aactaagctg tcagtttaca ctcagggtat tggcttaaca 1020

ggtatcgagg tttatgacct cttgcgagac gaatacgaca ttcagatcga gtttggtgat 1080

<213> Streptococcus pneumoniae

<400> 497
gagaaaaaga tgagaaatgt aagagttgca accattcaga tgcaatgcgc taaggatgtg 60

gcaacaaata tccaaaccgc agagcgttta gtacgtcagg ctgctgagca aggagcccaa 120

attattctct tgcccgagtt gtttgaacat ccctatttct gtcaggaacg tcagtatgac 180

tactaccagt atgcccaatc tgtagcggaa aatactgcca ttcagcattt taaggtgatt 240

gctaaggaac tacaagttgt tttaccaatc agtttctatg aaaaagatgg taatgtcttg 300

tataactcta ttgccgtcat tgatgcagat ggggaagtgc tgggcgttta tcgaaagacc 360

catataccag atgaccatta ttatcaagaa aaattctatt tcacgcctgg taacactggt 420

ttcaaggtct ggaatactcg ctatgctaag attggtatcg gtatctgttg ggatcaatgg 480

ttccctgaaa cagcgcgctg tcttgcattg aatggtgctg aattgctctt ttatcctaca 540

gctatcggtt cagagccaat tttggatata gatagttgtg gtcactggca acgtactatg 600

caagggcacg cagcagcgaa tattgttcca gtcatcgcag ccaatcgtta tggtttagag 660

gaggttactc ctagtgagga aaatggcgga cagagctcca gtcttgactt ctacggttcc 720

tcctttatga cggatgaaac aggagctatt ctagaacgag ctgaaagaca agaagaagct 780

gttctgttag ctacttatga cctagacaag ggagcaagtg aacgcctaaa ctggggcttg 840

tttcgagata gaagaccaga aatgtataga caaattacag attag 885

<210> 498
<211> 363
<212> DNA
<213> Streptococcus pneumoniae

<400> 498
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ttagcaaaag gttactatgg agctaaacac atcttgttcc gtactgcaaa agaacaagta 120

atgaactctt actactatgc ataccgtgac cgtcgtcaga aaaaacgtga cttccgcaaa 180

ttgtggatta ctcgtatcaa tgcggcagct cgtatgaacg gactttcata ctcacaattg 240

atgcatggtt tgaaattggc tgagatcgaa gttaaccgta aaatgcttgc tgacttggct 300

gttaacgatg cagtagcttt cacagctctt gcagatgcag ctaaagcaaa acttggtaaa 360

taa 363

<210> 499
<211> 555
<212> DNA
<213> Streptococcus pneumoniae

<400> 499
gagcctatca tggagtttga agaaaaaacg cttagccgaa aagaaatcta tcaaggacca 60

atatttaaac tggtccaaga tcaggttgaa ttaccagaag gcaagggaac tgcccaacgg 120

gatttgattt tccacaatgg ggctgtctgt gttttagcag taacggatga acaaaaactt 180

atcttggtca agcagtaccg caaagctatc gaggctgtct cttacgaaat tccagccgga 240

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tgtaatgaga agttaaaact atatttagca agcgatttga caaaagtgga aaatccgcgt 420

ccgcaggatg aggatgaaac cttggaagtc cttgaagtga gcttagaaga agcgaaagaa 480

ttaatccaat caggtcatat ctgtgatgcc aagacaatta tggctgttca gtattgggag 540

ttgcagaaaa aatag 555

<210> 500
<211> 585
<212> DNA
<213> Streptococcus pneumoniae

<400> 500
ctggaatttt tgaataaagg aggacaaatg aaaaaagtaa tgtttgctgg cttaagtctc 60

ttgtcattag ttgtattgat ggcctgtggt gaggaagaaa ctaaaaagac tcaagcagca 120

caacagccaa aacaacaaac gactgtacaa caaattgctg ttggaaaaga tgctccagac 180

ttcacattgc aatccatgga tggcaaagaa gttaagttat ctgattttaa gggtaaaaag 240

gtttacttga agttttgggc ttcatggtgt ggtccatgca agaaaagtat gccagagttg 300

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gatatcccag ttctttatga taccaaagca accaccttcc aagcttatca aattcgaagc 480

attcctacag aatatttaat tgatagccaa ggaaagattg gaaagattca atttggtgct 540

atcagtaatg cggatgcaga agcagcattt aaagaaatga actag 585

<210> 501

<211> 1269
<212> DNA
<213> Streptococcus pneumoniae

<400> 501
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aatgctattg ccaaagaaga agaacgccaa caaaataata tcgagttaat tgcttcggaa 120

aacgtagttt ccaaggctgt tatggcagct caagggtcta tcttgacaaa taaatatgcc 180

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cttgctattg aacgcgcaaa agaaattttc ggtgctaaat ttgccaatgt tcaaccacat 300

tcaggaagcc aagctaactg tgcggcttac atgtccttga ttgagccagg tgatacggtt 360

atgggaatgg atttggcatc aggtggtcat ttgactcatg gggctcctgt tagcttctct 420

ggtcaaacct acaactttgt ttcttatagt gttgatccta aaacggaact cttagacttt 480

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gaagaaagtc gcaaagtggc tgaactcatc attaaaaccc ttaagaattc agaaaatgag 1200

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<210> 502
<211> 1035
<212> DNA
<213> Streptococcus pneumoniae

<400> 502
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gttgcaacta ttgcttgggg aaatcatgat gtagcattag ctttaggaat agttcctgtt 240

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gaaaaaatca aagaactaaa tggtaaagct aacctatttg acgatttgga tggacttaac 360

tttgaagcaa tatcaaattc taaaccagat gttatcttag caggttattc tggtataact 420

aaagaagatt atgacactct atcaaaaatt gctcctgtag cagcatacaa atctaaacct 480

tggcaaactt tatggagaga tatgattaaa attgattcaa aagccttagg tatggaaaaa 540

gaaggtgatg agttaatcaa aaatactgaa gctcgtatat ccaaagaatt agaaaaacat 600

ccagaaatca aaggaaaaat caaaggaaaa aaagtattat ttactatgat taatgctgca 660

gatacatcaa aattctggat ttatactagc aaagatccaa gagcaaatta tttaacagat 720

ttaggtctag ttttccctga atcattaaaa gaatttgaga gtgaagatag ttttgcaaag 780

gaaatttctg cagaagaagc aaataagata aatgatgctg atgtaatcat aacttatggt 840

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aaaaatggtg ccgttgctgt aattccagat aatacaccgt tagcagcctc atgcactcca 960

acaccacttt caataaacta tactattgaa gaatacctaa atcttttagg aaatgcatgc 1020

aaaaatgcga aataa 1035

<210> 503
<211> 2700
<212> DNA
<213> Streptococcus pneumoniae

<400> 503
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gaaaaaataa tacagttgaa agaattatca acgcaggaag attatcaagg tctaaaccgt 180

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aatattgatc aggactattt aggtaaatta tctacaacga ttaaattggt agcagaaaag 360

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tttgaatatg ctaaactttg tgaagacgag caagttaagg ccatctatga gactatttta 2460

aatgaatggc aagttactaa gaacgttatc ttggctattg aaggacatga cgaactctta 2520

gctgacaatc catatctaaa agctagtctg gattaccgta tgccttactt taatattctc 2580

aactatattc agttggagtt gattaaacgc caacgtcgtg gagaattgtc cagtgatcaa 2640

gaacgattga ttcatatcac catcaacgga attgcgacag gattgcgtaa ttcaggttga 2700

<210> 504
<211> 372
<212> DNA
<213> Streptococcus pneumoniae

<400> 504
aagaaattat cggaggttag ccatatggca tttgaaaaaa tcattcagtt aaaaaattgt 60

cgttacgatt acactcttag cccttctgtt aaaaaattca ccctcaaaga taacaccttt 120

tttgaaacta aggttggtaa ctatgaactg actcgccttt tggaaaaagt gccaaacagc 180

ggtgaaggct tccaactcaa aatcatcatt aacaaggaac ttacaggggc taaaatcaat 240

atcactgaca agtttggcct tcgtctagtt gatattttca aatcagaaga ccaccatatt 300

catcaggaaa aattctactt cctcatggat agcttggtag aacgtggtgt ctttacaaaa 360

tcggaaagat ag 372

<210> 505
<211> 1050
<212> DNA
<213> Streptococcus pneumoniae

<400> 505
aatagaaaag ataaaaatac acaaatccca gttcatatat gtaaggtaaa tataactagg 60

atttataaag tttacagagg acggtctata atgtcagata gaaaaaacat gaaacttttc 120

gcactcaact ctaaccaaga gattgcacaa aaaattgccc aagctgttgg tgtcccactt 180

ggaaaactat catcacgtca attttcagac ggagaaatcc aagtaaatat cgaagaaagt 240

gtccgtggtt atgatgttta catcatccaa tcaacaagtt tccctgtcaa caaccaccta 300

atggaattgt taatcatggt cgatgcttgt gtgcgtgcaa gtgcccacag tatcaacgtt 360

gtccttccat attttggcta tgcacgtcaa gaccgcattg cttgtcctcg tgagccactt 420

acagcaaaac tagttgccaa tatgctggtt aaggctggag ttgatcgtat cctgactctt 480

gatttgcatg ccgttcaggt tcaaggtttc tttgatattc cagtggataa tcttttcact 540

gttcccctat tcgcaaaaca ttactgcgat aaaggattgc ttggttcaga tgttgttgtc 600

gttagcccta aaaattcagg tgtcaaacgt gcgcgtagcc tggctgaata tcttgatgct 660

cctatcgcca ttatcgacta ccctcaagac gatgcaactc gtaacgaagg ttatattatt 720

ggtgatgttg aaggtaagaa agctatcttg attgatgata ttttaaatac aggacgtacc 780

ttctctgaag cttctaaaat cgttgaacgt gaaggagcta cagaaattta tgctgtttct 840

agccacggtc tcttcgtcga gggagctgct gagcttcttg acaatactaa tattaaagaa 900

attcttgtga ctgattcagt agcaacaaaa gaaaaaactc ctaaaaatgt atgctacatc 960

actgctagtg agttaattgg tgatgctatc gtccgtattc acgaaagaaa accagtcagc 1020

ccactctttg cctacaataa aaagaaataa 1050

<210> 506
<211> 1470
<212> DNA
<213> Streptococcus pneumoniae

<400> 506
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aatttagtaa atggaaaatg gaaatcatct gaacaagaaa ttacgattta ttcaccaatc 120

aatcaagaag aattgggtac agttccagcc atgactcaga ctgaagctga tgaggctatg 180

caagctgcgc gtgcagccct gccagcatgg cgagctttat cagcagttga acgtgcggct 240

tatttgcata aaacagcagc tattttagaa cgcgataagg aagaaattgg tactatcctt 300

gccaaagaag tagcaaaagg gattaaagca gcaattggag aagtagtgcg tacagcagac 360

ttgattcgtt atgctgctga ggaaggtctc cgtatcactg gacaagcaat ggaaggtggt 420

ggttttgagg caacaagtaa aaacaaactg gctgttgtcc gtcgtgaacc agttggtatc 480

gtgctagcga ttgctccctt taattatcca gttaatttat ctgcttctaa aattgcacct 540

gccttgattg cagggaatgt ggtcatgttt aagccaccaa cacaaggttc catttctgga 600

ctcttgttgg ctaaagcatt tgaagaagca gggattccgg caggtgtttt caacaccatt 660

acaggtcgtg gttcagaaat tggggattat atcattgagc acaaagaagt caacttcatc 720

aactttacag gttcaactcc tattggagaa cgtattggtc gtttagctgg tatgcgtcct 780

atcatgttgg aacttggtgg gaaagatgca gctcttgtac tagaagatgc agatttggaa 840

catgctgcca agcaaattgt tgcgggagcc tttagctact caggacaacg ttgcacggcc 900

attaaacgtg tcattgttct cgaaagtgta gcagataaat tagctacttt gcttcaggaa 960

gaagtttcta aattaacagt tggtgatcca tttgacaatg ctgatattac acctgttatt 1020

gacaatgctt cagccgactt catttggggc ttgattgagg atgcacaaga aaaagaagct 1080

caggctctta caccaatcaa acgtgagggc aatcttctct ggccagtgct ttttgaccaa 1140

gttacaaaag atatgaaagt ggcatgggaa gagccatttg gtcctgtttt accaatcatt 1200

cgtgtggcta gtgtagagga agctattgcc tttgccaacg aatctgaatt cggccttcaa 1260

tcatcagtct ttacaaatga tttcaaaaaa gcctttgaaa ttgctgaaaa acttgaagta 1320

ggtacagtcc acattaataa taaaacccag cgtggtccag ataatttccc attccttggt 1380

gtcaaaggtt ctggagctgg agtgcaagga attaaatata gcattgaagc gatgacaaat 1440

gtcaaatcca ttgtttttga tgtgaaataa 1470

<210> 507
<211> 993
<212> DNA
<213> Streptococcus pneumoniae

<400> 507
aagaggtata aaatggcttt aacagaacaa aaacgtgtac gcttagaaaa actttctgat 60

gaaaatggta tcatctcagc tcttgcattt gaccaacgtg gtgctttgaa acgcctcatg 120

gttaaacacc aaacagaaga accaactgtg gcccaaatgg aagaacttaa agtcttggta 180

gcagatgaat tgactaaata tgcttcatct atgcttcttg accctgagta tggacttcca 240

gcaactaaag ctcttgatga aaaagctggt cttctccttg cttatgaaaa aacaggttat 300

gacacaacaa gcacaaaacg cttgccagac tgcttggatg tttggtctgc aaaacgtatt 360

aaagaagaag gtgcagatgc agttaaattc ttgctttact atgatgtaga tagctcagac 420

gaactcaatc aagaaaaaca agcctacatc gaacgcatcg gttctgagtg tgtggctgaa 480

gatatcccat tcttccttga aatccttgct tacgatgaaa aaattgcgga tgcaggttct 540

gtagaatacg ctaaagtaaa accacacaaa gttatcggcg ctatgaaagt cttttcagac 600

ccacgcttta acattgatgt tttgaaagtt gaagttcctg ttaacattaa atatgttgaa 660

ggcttcgctg aaggtgaagt agtttataca cgtgaagaag cagcagcctt cttcaaagcg 720

caagatgaag caacgaactt gccatacatc tacttgagtg ctggtgtatc agctaaactc 780

ttccaagata ctcttgtatt tgctcatgaa tcaggtgcga actttaacgg agttctttgt 840

ggccgtgcta catgggcagg atcagttgaa gcttacatca aagatggtga agcagcagct 900

cgcgaatgcg ttcgcacaac tggatttgaa aacattgacg aactcaacaa agttcttcaa 960

agaacagcaa cttcatggaa agaacgcgtg taa 993

<210> 508
<211> 546
<212> DNA
<213> Streptococcus pneumoniae

<400> 508
ttagattata gtaagaaagg taagttaaaa atgagaattg caattggatg tgaccacatc 60

gtaactgatg aaaaaatggc ggtttcagaa tttttgaaat caaaaggata tgaagtcatt 120

gactttggta cctatgacca tacacggact cactacccaa tctttggtaa aaaagtaggg 180

gaagctgtaa ctagcggtca agctgatctt ggagtatgta tctgtggtac tggtgttggt 240

atcaacaacg ctgtaaataa agttccaggt gttcgttctg ccttggttcg tgatatgaca 300

acagcccttt atgctaaaga acaattgaac gctaacgtta ttggttttgg tggtaaaatt 360

actggtgaat tgcttatgtg tgatatcatc gaagctttca tccatgctga atacaaacca 420

actgaagaaa acaaaaaatt gattgcgaaa attgaacatg ttgaaagtca caatgctcaa 480

caaacagacg caaacttctt tacagaattc cttgagaaat gggatcgtgg agaataccac 540

gactaa 546

<210> 509
<211> 441
<212> DNA
<213> Streptococcus pneumoniae

<400> 509

aaaggagtat acaatatgtc tattgttatc ggtgcagatg ctgcaggttt gagattgaaa 60

gaagttgtga aagacttctt agaaaaagaa aacttccacc ttgtggatgt tacagctgaa 120

ggtcaagact ttgttgatgt gactctcgct gttgctgcag aagtaaacaa agaagaacaa 180

aaccttggta tcgtgattga tgcttatgga gctggtccat ttatagttgc aactaagatc 240

aaaggaatgg ttgctgcaga agtatctgac gaacgttcag cttatatgac tcgtggccac 300

aacaactcac gtatgatcac tatgggagca caacttgttg gtgatgaatt ggctaaaaat 360

atcgctaaag gatttgttaa tggtaaatac gacggtggtc gtcaccaaat ccgggttgac 420

atgttgaaca aaatgggcta a 441

<210> 510
<211> 1893
<212> DNA
<213> Streptococcus pneumoniae

<400> 510
cagggtatgg tcttgtcaaa atatcaaaaa caatttataa taaatagata ccctgaaagg 60

aagagaatca tgaacttaga agaattgaaa aaacgacagg agaagatccg taacttctct 120

attatcgccc atattgacca cggaaaatca actctagcag accgcatttt ggaaaaaaca 180

gagacggttt caagtcgtga aatgcaggcc cagcttttgg atagcatgga gctagagcgg 240

gaacgtggaa ttactattaa gttgaatgcc atcgagttga attacactgc aaaagatggg 300

gaaacttata ttttccactt gattgacaca ccagggcacg ttgactttac ctatgaagtt 360

tcacgttcgc tagctgcctg tgagggtgct attttggtgg tcgatgcggc tcaaggaatt 420

gaggctcaaa ctcttgccaa cgtttatctg gctttggata atgatttgga aatcatgcct 480

atcattaata aaattgacct gccggctgca gatccggagc gcgtgcgtac agagattgaa 540

gatgtgattg gtttggatgc cagtgaagca gttttggctt ctgccaaggc tggtattggg 600

attgaagaaa tcctcgagca aattgtagaa aaagtaccag caccaacggg tgatgtgacg 660

gcgccactta aggccttgat tttcgactct gtttacgatg cttaccgtgg ggttatcctc 720

caagtgcgtg tcatggacgg agtggtcaaa cctggtgata agattcagct catgagcaat 780

agtaagacct ttgatgtggc cgaagtcggt atttttacac caaaagcggt tggtcgtgat 840

ttccttgcga ctggtgatgt tggttacatt gcggcgtcta tcaagacggt tcaggatact 900

cgtgtgggtg ataccgttac cttggcaacc aatcctgcgg cagaaccatt acatggttat 960

aagcagatga atcctatggt ctttgcgggt ctctacccaa tcgaatcaaa caagtacaat 1020

gacctgcgtg aagcgcttga aaaattgcaa ctgaatgatg ctagtcttca gtttgaacca 1080

gaaacatctc aggcacttgg atttggtttc cgttgtggat ttcttggact tctccatatg 1140

gatgttatcc aggaacgttt agagcgtgag ttcaatattg acctcatcat gacagctccg 1200

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gctgaaattg tctttgactt ctttgataaa cttaagtctt cgacacgtgg ttatgcaagc 1500

tttgactacg aattgtcaga atatcgccca tctaagctgg tgaaaatgga tattcttctc 1560

aatggagata aggtggatgc cctcagcttt atcgttcaca aggactttgc ctacgaacgt 1620

gggaaactca tcgttgataa actcaagaaa atcatccctc gccaacaatt tgaagttcca 1680

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aacgtacttg ctaaatgtta tggtggtgac gtttctcgta agcgtaaact ccttgaaaaa 1800

caaaaagctg gtaagaaacg catgaaatcc atcggatcag ttgaagttcc gcaagaagcc 1860

ttcctcagcg tcttgagtat ggatgaagaa taa 1893

<210> 511
<211> 1347
<212> DNA
<213> Streptococcus pneumoniae

<400> 511
gtggagatgg aaaagtattt atcggtaaca actttgacca agtatctgaa aatgaaattc 60

gataaagacc catacttgga acgggtctat ttaactggtc aagtttccaa ctttcgtaaa 120

cgacctactc accaatattt ctccctaaag gatgaccatg cagttattca agcgaccatc 180

tggtctggga tttatcagaa attagggttt gacctggaag aaggaatgaa gatcaatgtg 240

attgggcgtg tacaggtcta tgaaccaagt ggtagctact ccatcatcat tgaaaaagct 300

gagcctgatg gggttggggc gcttgcgatt cagtttgaac aacttaagaa aaaattgaca 360

gaagaaggcc tgtttcaaga acgcttcaag caagctctgc cccaattttc taagagaatt 420

ggtgtagtaa ccagccgtag tggagccgtt attcgagata ttatcacgac cgtcagcagg 480

cgattcccag gtgttgacat ccttctttat ccgaccaagg ttcaaggtga aggggctgcg 540

gaggaaattg ctagaaatat tgcgcgtgct aatcaacggg acgatttgga tttgctcatt 600

attggtcgtg gaggtggttc tattgaggat ctctgggcct ttaacgaaga aattgtggta 660

cgagctattt ttgaatctcg tttgccagtt atctctagtg tggggcatga gacggatgtg 720

accttggcag attttgtggc agatcgacgc gctgcaacgc caacagcggc ggctgaactg 780

gcaacacctg tgaccaagtt ggatgtatta gctcatttgc aaaatcagga aaaacggatg 840

gtaacggcag tccgaaatgt tctatctaag aaacaagagg ctttgaaaaa atgcagtcag 900

tctgttatct ttagacaacc tgagcgcttg tatgacggtt atttgcaacg cttggaccaa 960

ctgcaactgc gtttgaaaca aagtttgcga actcggattt ctgataacaa acaattagtt 1020

caagcaagaa ctcatcaatt agtacaatta tcacctgtta ccaaaatcca acgctatcaa 1080

gaccgtttag gacagttgga caagctctta ggtagccaaa tggcgttagt ttatgacgcc 1140

aaggttgctg aggccaagcg actttcggaa gctttgctca tgttggatac tagccgaatc 1200

gtggcgcgtg gttatgctat tgtcaaaaaa gaagagtccg ttgtagattc ggttgagagt 1260

ttgaagaaaa aagaccaagt aacgcttttg atgcgagatg gtcaagtaga attagaggtt 1320

aaagatgtca aaacaaaaga aatttga 1347

<210> 512
<211> 750
<212> DNA
<213> Streptococcus pneumoniae

<400> 512
agcataatgt ctcaaaaaaa taataaaaag aaaaacaagc gaaaaaatct gctgacaaat 60

atcctagcag gatttctgat attactgtca ctggctttga tttttaatac tcaaattcga 120

aatattttca tagtctggaa taccaataag tatcaagtta gccaggtatc aaaagaaaaa 180

ttagaagaaa atcaggatac agaaggcaat tttgactttg attctgtcaa agctatctct 240

tcggaagctg ttctaacttc tcaatgggat gctcaaaaat taccagttat tgggggaatt 300

gcaattcctg aattggaaat gaatttgccg atttttaaag gacttgataa tgttaatctc 360

ttctacggag ctggtacaat gaaacgcgag caagtaatgg gagaaggaaa ttatagtcta 420

gctagtcacc atatctttgg tgttgataat gctaataaaa tgttattttc tcctttagat 480

aatgctaaaa atggcatgaa gatttatcta accgataaaa ataaagttta tacttatgaa 540

atacgtgaag tcaaacgtgt gacaccggat cgtgttgatg aagttgatga tagagatggg 600

gtcaatgaaa tcacattagt aacctgtgaa gaccttgctg ctacagaacg tattattgtc 660

aaaggtgatt tgaaagaaac aaaagattat tcacaaacat ctaatgaaat cctaacagct 720

ttcaatcaac catataaaca attttattaa 750

<210> 513
<211> 1026
<212> DNA
<213> Streptococcus pneumoniae

<400> 513
ggaaaatccc ctaataaaat taaggagatg tttaaaacaa tgacttcaac taaacaacac 60

aaaaaagtta tccttgtcgg tgatggtgct gtaggttcat cttacgcttt tgcacttgtt 120

aaccaaggaa ttgcacaaga gcttggaatt atcgaaattc cacaattgca tgaaaaagct 180

gttggtgatg cgcttgacct tagtcacgcc cttgccttca cttcacctaa aaaaatctat 240

gcagctcaat actctgactg tgcagacgct gaccttgttg tgatcactgc aggtgcacct 300

caaaaaccag gtgaaactcg tcttgacctt gtaggtaaaa accttgctat caacaaatca 360

atcgtaactc aagttgttga atctggtttc aaaggtatct tccttgttgc tgctaaccca 420

gttgacgttt tgacttactc aacttggaaa ttctctggtt tccctaaaga acgcgttatc 480

ggttcaggta cttcacttga ctcagctcgt ttccgtcaag cacttgctga aaaattggat 540

gtggatgctc gttcagtgca cgcctacatc atgggtgaac acggtgactc tgagttcgct 600

gtttggtcac acgctaacat cgctggtgta aaccttgaag aattcctaa agacactcaa 660

aatgttcaag aagctgaatt gattgaattg ttcgaaggtg ttcgtgatgc agcctacaca 720

atcatcaaca aaaaaggtgc aacatactac ggtatcgcag tagcccttgc tcgtatcact 780

aaagcaatcc ttgacgatga aaacgcagta cttccacttt cagtattcca agaaggtcaa 840

tacggagttg agaatgtctt tatcggtcaa ccagctgttg ttggtgcaca tggtatcgtt 900

cgtccagtaa atatcccatt gaacgacgca gaaactcaaa aaatgcaagc atctgctaaa 960

gaattacaag ctatcattga cgaagcatgg aaaaacccag aattccaaga agcttctaaa 1020

aactaa 1026

<210> 514
<211> 588
<212> DNA

<213> Streptococcus pneumoniae

<400> 514
aaaaattcaa gcctatcatt cttagaaagg aaaactatgg caaacattct cttggctgta 60

acgggttcaa tcgcctctta taagtcggca gatttagtca gttctctaaa aaaacaaggc 120

catcaagtca ctgtcttaat gactcaggct gctacagagt ttatccaacc tttgacacta 180

caggtactct cacagaatcc tgtccacttg gatgtcatga aggaacccta tcctgatcag 240

gtcaatcata tcgaacttgg aaaaaaagca gatttattta tcgtggtacc tgcaactgct 300

aacactattg caaaactagc tcacggattt gcggacaaca tggtaaccag tacagctcta 360

gccctaccaa gtcatattcc caaactaata gctcctgcta tgaatacaaa aatgtatgac 420

catccagtaa ctcagaataa tctgaaaaca ttagaaacct acggctatca gctgattgct 480

cctaaggaat ccctactagc ttgtggagac cacggacgag gagctttagc tgacctcaca 540

attattttag aaagaataaa ggaaactatc gatgaaaaaa cgctctaa 588

<210> 515
<211> 924
<212> DNA
<213> Streptococcus pneumoniae

<400> 515
acacagcctt taaaacagtg tttaagtggg aagtataagt actggaggtt aattgtggag 60

aaaatcatta aagaaaaaat ttcttcctta cttagtcaag aagaggaagt cctcagtgtt 120

gaacaactgg gtggaatgac caatcaaaac tatttggcca aaacaacaaa taagcaatac 180

attgttaaat tctttggtaa agggacagaa aagcttatca atcgacaaga tgaaaagtac 240

aatcttgaac tactaaagga tttaggctta gatgtaaaaa attatctttt tgatattgaa 300

gctggtatca aagtaaatga gtatatcgaa tctgcgatta cgcttgattc aacgtcaatc 360

aagaccaagt tcgacaaaat tactccaata ttacaaacta ttcatacgtc tgctaaggaa 420

ttaagaggag aatttgctcc ttttgaagaa atcaaaaaat acgaatcctt gattgaagaa 480

caaattcctt atgccaacta tgaatctgtt agaaatgcag tcttctcctt agagaaaaga 540

ctggctgact taggtgttga cagaaaatct tgtcatatcg atttggtgcc tgaaaacttt 600

atcgaatcac ctcaaggacg actttatttg attgactggg aatattcatc aatgaatgat 660

ccaatgtggg atttggctgc cctcttttta gagtctgaat tcacttccca agaggaagaa 720

actttcttat ctcactatga gagtgaccaa acaccggttt ctcatgaaaa gattgctatt 780

tataaaattt tacaagatac tatttggagt ctatggactg tctataagga agagcaaggt 840

gaagattttg gtgactatgg tgtgaatcgt taccaaagag ctattaaagg tttggcttct 900

tatggaggtt cagatgaaaa gtaa 924

<210> 516
<211> 813
<212> DNA
<213> Streptococcus pneumoniae

<400> 516
gagtttaaaa tgaaacaact aaccgttgaa gatgccaaac aaattgaatt agaaattttg 60

gattatattg atactctctg taaaaagcac aatatcaact atattattaa ctacggtact 120

ctgattgggg cggttcgaca tgagggcttt atcccttggg acgacgatat tgatctgtcc 180

atgcctagag aagactacca acgatttatt aacatttttc aaaaggaaaa aagcaagtat 240

aagctcctat ccttagaaac tgataagaac tactttaaca actttatcaa gataaccgac 300

agtacgacta aaattattga tactcgaaat acaaaaacct atgagtctgg tatctttatc 360

gatattttcc ctatagatcg ctttgatgat cctaaggtca ttgatacttg ttataaactg 420

gaaagcttca aactgctgtc tttcagtaaa cataaaaata ttgtctataa ggatagcctt 480

ttaaaagatt ggatacgaac agccttctgg ttactccttc gaccggtttc tcctcgttat 540

tttgcaaata aaatcgagaa agaaattcaa aaatatagtc gtgaaaatgg gcaatatatg 600

gcttttatcc cttcaaaatt taaggaaaag gaagtcttcc caagtggtac ctttgataaa 660

acaatcgatt taccctttga gaatttaagc cttcctgcac ctgaaaaatt tgatactatt 720

ttgacacaat tttatggaga ttatatgacc ctaccaccag aagaaaaacg cttctacagt 780

catgaatttc acgcttataa attggaggat tag 813

<210> 517
<211> 357
<212> DNA
<213> Streptococcus pneumoniae

<400> 517
gagaataaaa tgaatccatt aatccaaagc ttgactgaag gtcaacttcg tacagatatc 60

ccatcattcc gtcctggtga cactgttcgt gtacatgcga aagttgtcga aggtaaccgt 120

gaacgtatcc agatttttga aggtgttgtt atcgcacgta aaggtgctgg aatctcagaa 180

aactacacag ttcgtaaaat ctctaacggt gtaggtgttg agcgtatctt cccaatccac 240

actccacgtg ttgaaaaaat cgaagttgtt cgttacggta aagtacgtcg tgcgaaattg 300

tactacttgc gtgctcttca aggtaaagca gctcgtatca aagaaatccg tcgttaa 357

<210> 518
<211> 459
<212> DNA
<213> Streptococcus pneumoniae

<400> 518
attgaggagg acgatatggc attagcaaaa attgtatttg ccagtatgac cggtaatacc 60

gaagaaattg cagatattgt agcagacaaa ttacgtgact tgggcttgga tgttgatgtt 120

gatgaatgta caactgttga cgcttcagac ttcttggaag cagacatcgc tatcgttgcg 180

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<211> 438
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<213> Streptococcus pneumoniae

<400> 519
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actggtcttg gtcttaaaga agctaaagaa cttgttgacg gtgcaccagc acttgttaaa 360

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tcagttactc ttaaataa 438

<210> 520
<211> 627

<212> DNA
<213> Streptococcus pneumoniae

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acactaatga gtgaagcaat tattgctaaa aaagcggaac tagttgacgt agtagctgaa 180

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gcagaaagca aagaagacgc ggcttaa 627

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<213> Streptococcus pneumoniae

<400> 521
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gttagtcgtg taaccacgga catcgaacag ttggcagctg gcttgaccat gatttttaac 480

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<211> 1053
<212> DNA
<213> Streptococcus pneumoniae

<400> 522
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ccatttacaa ttaaagcagt taggaataaa aacactgtca aagatacaac aagttattca 180

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aacttgttag agaaaaaaat tgatgggttg attgagaaat ttaaacatgc ctatgcaaat 540

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gcgcttggct taaatgtgaa aaatctgatt cttcgtttag ttgttattgg agtggtttgt 660

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tctatcctcg gtgtagcaac ctttaaatta taa 1053

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<211> 1329
<212> DNA
<213> Streptococcus pneumoniae

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aaacagacag ataacaagtt aaacgtagcc tacgagttag gagaacaaga ggggcaaaaa 720

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ttaagataa 1329

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<211> 825
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<213> Streptococcus pneumoniae

<400> 524
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gaatccatta aggggattga tatgcaattt gaaagaaata aaattacagc tttgattggc 180

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gctaagtcaa tttaccgtaa tattaccttt gcgcatgaac gtgctggagt taaggataag 420

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aagctacagt ccaccaatga ctatgtatct ggtcactttg gttag 825

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<211> 1395
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<213> Streptococcus pneumoniae

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aactctaaca tctctttcct aggatgtgga atggctcttt ggattggtga acaaattgac 180

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<211> 1263
<212> DNA
<213> Streptococcus pneumoniae

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<211> 873
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<213> Streptococcus pneumoniae

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<212> DNA
<213> Streptococcus pneumoniae

<400> 528
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<213> Streptococcus pneumoniae

<400> 529
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gaagctgctc gcaacttcca agtttacgct cagaaagtgc gtaaactttt gacagatatc 180

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<213> Streptococcus pneumoniae

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cgtcagacag ggaaaacaac cattgcgatt gatacaatct tgaaccaaaa agatcaagat 600

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<213> Streptococcus pneumoniae

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gagaaaaaaa tgtctctgaa agtaaggagt gtaaaagaac aaatcgatga aagtctcatt 480

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aaagttgtta aagaaaattt gaaatag 567

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<211> 498

<212> DNA
<213> Streptococcus pneumoniae

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gaagtattgg ctcaaaaacg cgaagatgaa ttggctggta gccgtaaaga agctaagaca 240

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cagctaggag aagcttaa 498

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<213> Streptococcus pneumoniae

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<211> 252
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<213> Streptococcus pneumoniae

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aacgaagatt aa 252

<210> 535
<211> 312
<212> DNA
<213> Streptococcus pneumoniae

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gatttccgtg aaggacttta ccacatcgtt aacgttgaag caaatgacga tgcagctctt 240

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<211> 1638
<212> DNA
<213> Streptococcus pneumoniae

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<213> Streptococcus pneumoniae

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<213> Streptococcus pneumoniae

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<211> 1260
<212> DNA
<213> Streptococcus pneumoniae

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<211> 1164
<212> DNA
<213> Streptococcus pneumoniae

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<211> 1317
<212> DNA
<213> Streptococcus pneumoniae

<400> 542
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ggaacttgta tcaacattgg ttgtatccca actaaaacct tgctagttgc tgctgaaaag 180

gacttgtctt ttgaagaagt cattgctact aaaaacacga tcactggtcg cctcaacggt 240

aaaaactatg cgactgttgc tggtacaggc gtagatatct ttgatgcgga agctcacttc 300

ctttcaaata aagtcatcga aatccaagct ggtgatgaaa agaaagaact gactgctgaa 360

acaatcgtca tcaacactgg tgctgtttca aacgtcttgc caatccctgg acttgctaca 420

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agcaaggtca cagtcctaga tgccttggat acattcctac ctcgtgcaga accttccatc 600

gcagctcttg ctaaacaata catggaagaa gatggcattg aattgcttca aaatatccat 660

actactgaaa tcaaaaacga tggtgaccaa gtgcttgtcg taactgaaga cgaaacttac 720

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atcatcaaca tcatcactgt tgctatggac aacaagattc cttacactta cttcacaaaa 1260

caaatcttca ctcacccaac cttggctgag aacttgaatg acttgtttgc gatttaa 1317

<210> 543
<211> 2370
<212> DNA
<213> Streptococcus pneumoniae

<400> 543
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gccagtacca gcacttggca aatcgttaaa cgaaatgtct ttacccтttt taacgctttg 180

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gctgttatct gctttaacgc tttttctggg attgtgaccg agctacgagc caaacacatg 300

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cagattccta gtgatgcctt ggttttggaa ggctttgcgg aagtcaatga agccatgtta 480

acgggagaaa gtgatttggt gcaaaaggaa gttgacggct tacttttgtc aggaagtttc 540

ctagccagtg ggtcagtttt atctcaagtt caccatgtcg gtgcagacaa ctatgctgcc 600

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gcgcgcgtgg atatgctctg tctggacaag acgggtacca tcacccaagg aaagatgcag 960

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ctgaccagtc gttaccaagc gaaaaaataa 2370

<210> 544
<211> 294
<212> DNA
<213> Streptococcus pneumoniae

<400> 544
agccaaataa aaaggagaaa catcatggca atctcaaaag agaaaaaaaa tgaaatcatc 60

gcacaatatg cacgtcacga aggtgataca ggttcagtag aggttcaagt tgctgtcctt 120

acttgggaaa tcaaccacct taacgaacac atcaaacaac acaaaaaaga ccacgctact 180

taccgtggat tgatgaaaaa aatcggtcgc cgtcgtaact tgcttgcata cttgcgtaaa 240

aacgacgtta accgttaccg tgagttgatc aactctctag gacttcgtcg ctaa 294

<210> 545
<211> 1953
<212> DNA
<213> Streptococcus pneumoniae

<400> 545
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atgacacgtt atcaagatga tttttatgat gctatcaatg gagaatggca acagacagct 120

gaaatcccag cagataagtc tcaaacagga ggttttgttg atttagacca ggaaattgaa 180

gacctgatgc tggcgacaac agacaagtgg ttagcaggtg aagaagtgcc tgaggatgct 240

atcttggaaa actttgtcaa ataccaccgc ctagttcgtg attttgacaa gagagaagct 300

gacggtatca cacctgtctt accactcctt aaagaattcc aagaattgga gacttttgcg 360

gattttacag ctaaactagc agagtttgag cttgcaggaa aaccaaactt ccttcctttt 420

ggtgtatcgc cagactttat ggatgctaga atcaatgttc tatgggctag cgctccaagc 480

acaatcttgc cagatacgac ctactatgca gaagaacatc ctcagcgcga agagctcttg 540

actctttgga aagaaagcag cgcaaatctc ctcaaggctt atgatttctc tgatgaagaa 600

attgaagact tgctagaaaa aagacttgaa ttggaccgcc gagttgcggc agtggtgctc 660

tctaatgaag aaagttcaga atatgctaaa ctctatcatc catattctta cgaagatttc 720

aagaaattcg cgcctgccct acctttggat gacttcttca aagcagttat tgggcaatta 780

ccagacaagg ttattgtaga cgaggaacgt ttctggcaag cagcagagca attctacagt 840

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agctatttaa cagaggatat ccgtgttttg tctggtgcct acagccgtgc cctttctgga 960

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caagccctgg gtctttggta cgcccgtgag aagttctctc cagaagccaa ggcggatgtg 1080

gagaaaaaag tggcaaccat gattgatgtt tataaggagc gtctgcttaa gaatgactgg 1140

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ggctatccag aagaattgcc tgcacgttac aaggataagg tagtgaatga aactgccagt 1260

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aaccagcctg tagattataa ggaatggggc atgcctgctc atatggtcaa tgcctactac 1380

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atgaaacttt tggctagcgt cgatgtgcac gcaccagcca aactccgtgt caatgtgcaa 1860

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cgttcaccag aggagcgcgt gattatttgg taa 1953

<210> 546
<211> 708
<212> DNA
<213> Streptococcus pneumoniae

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gcgattgacg ctggtaaatt gatcaaagaa gctggtatcg aatttgacca agcttacact 180

tcagtattga aacgtgctat caaaacaact aacttggctc ttgaagcttc tgaccaattg 240

tgggttccag ttgaaaaatc atggcgcttg aacgaacgtc actacggtgg tttgactggt 300

aaaaacaaag ctgaagctgc tgaacaattt ggtgatgagc aagttcacat ctggcgtcgt 360

tcatacgatg tattgcctcc aaacatggac cgtgatgatg agcactcagc tcacacagac 420

cgtcgttacg cttcacttga cgactcagtt atcccagatg ctgaaaactt gaaagtgact 480

ttggaacgtg ctcttccatt ctgggaagat aaaatcgctc cagctcttaa agatggtaaa 540

aacgtattcg taggagctca cggtaactca atccgtgccc ttgtaaaaca catcaaaggt 600

ttgtcagatg acgagatcat ggacgtggaa atccctaact tcccaccatt ggtattcgaa 660

ttcgacgaaa aattgaacgt cgtttctgaa tactaccttg gaaaataa 708

<210> 547
<211> 549
<212> DNA
<213> Streptococcus pneumoniae

<400> 547
gagagaacca tgtctttaaa agatagattc gatagattta tagattattt tacggaggat 60

gaggattcaa gtctccctta tgaaaaaaga gatgagcctg tgtttacttc agtaaattct 120

tcacaggaac cggctctccc aatgaatcaa ccttcacagt cggctggcac aaaagagaac 180

aatatcacca gacttcatgc aagacaacag gaattggcaa atcagagtca gcgtgcaacg 240

gataaggtca ttatagatgt tcgttatcct agaaaatatg aggatgcaac agaaattgtt 300

gatttattgg caggaaacga aagtatcttg attgattttc agtatatgac agaggtgcag 360

gctcgtcgtt gtttggacta tttggatgga gcttgtcatg ttttagctgg aaatttgaaa 420

aaggtagctt ctaccatgta tttgttgaca ccagtgaacg ttattgtaaa tgttgaagat 480

atccgtttac cagatgaaga tcaacagggt gagttcggtt ttgatatgaa gcgaaataga 540

gtacgataa 549

<210> 548
<211> 1389
<212> DNA
<213> Streptococcus pneumoniae

<400> 548
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aatgccaaaa gtaaaggtgt aaaggatgga attattgttg atattgatgc agcagcaact 180

gctatcaagt cagccatttc ccaagcggaa gaaaaggcag gcatttcgat taaatcagtg 240

aatgtcggct tgcctggtaa tcttttgcag gtagaaccaa ctcaggggat gattccagta 300

acatctgata ctaaggaaat tacggatcaa gatgttgaaa atgttgtcaa atcagctttg 360

acaaagagta tgacacctga ccgtgaagtc attaccttta ttcctgaaga atttattgtg 420

gatggtttcc aagggattcg tgacccacgt ggcatgatgg gggttcgcct tgaaatgcgt 480

ggtttgcttt atacaggacc tcgtactatc ttgcacaatt tgcgtaagac ggttgagcgt 540

gcaggtgttc aggttgaaaa tgttatcatt tcaccactag caatggttca gtctgttttg 600

aacgaagggg aacgtgaatt tggtgctaca gtgattgata tgggggcagg tcaaacgact 660

gtcgctacaa tccgtaatca agaactccag ttcacacata ttctccaaga aggtggagat 720

tatgtaacta aagatatctc caaggttttg aaaacctctc gcaaattagc ggaaggcttg 780

aaactgaatt acggggaagc ctatccgcct cttgcaagca aagaaacctt ccaagtagag 840

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gcacgaatca agcacatcct tgaacaaatc aagcaagaat tagatagaag gcgtctattg 960

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cgtaatccag cctttgcgca tgtgattagt ttatcagaat ttgcgggtca attaacagaa 1140

gttaatcttt tggctcaggg agcgataaaa ggtgagaatg acttaagtca tcagccaatt 1200

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gcttcacaaa ataaaccgaa attagcagat cgtttccgtg gattgatcgg aagcatgttt 1380

gacgaataa 1389

<210> 549
<211> 2073
<212> DNA
<213> Streptococcus pneumoniae

<400> 549
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attcggctta atttattgtt ttcaatcgtc attttactct ttatgaccat tattggtcgt 120

ttgttgtata tgcaggtttt gaacaaggat ttttacgaaa aaaagctagc ttcagctagt 180

cagaccaaga ttacaagcag ttcagcccgt ggggaaattt atgatgctag tggaaaacct 240
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tccattagcg gaaaaacagg tacagccgaa agctatgtgg cagatggtca gcaagcaacc 1920

aataccaatg cggtggccta tgcccatct gataatcccc aaatcgctgt cgcagtggtc 1980

tttcctcata ataccaatct aacaaatggt gtaggacctt ccattgcgcg tgacattatc 2040

aatctgtatc aaaaatacca tccaatgaat tag 2073

<210> 550
<211> 930
<212> DNA
<213> Streptococcus pneumoniae

<400> 550
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aatacgggaa aatatttagt ggagtgtgtc gagcatattc tgaagcaaac ctatcaaaat 120

atagaaatta ttttagttga tgacggttct acggataatt ctggggaaat ttgtgatgct 180

tttatgatgc aagataatcg tgtgcgagta ttgcatcaag aaaataaggg gggggcagca 240

caagctaaaa atatggggat tagtgtagct aagggagagt acatcacgat tgttgattca 300

gatgatatcg taaaagaaaa tatgattgaa actctttatc agcaagtcca agaaaaggat 360

gcagatgttg ttatagggaa ttactataat tatgacgaaa gtgacgggaa tttttatttt 420

tatgtaacag ggcaagattt ttgcgtcgaa gaattagcta tacaagaaat tatgaaccgt 480

caagcaggag attggaaatt caatagctcg gcctttatat tgccgacatt taagttgatt 540

aaaaaagaat tattcaatga agttcacttt tcaaatggtc gccgctttga tgatgaagca 600

actatgcatc gcttttatct tttagcctct aaaatcgtct ttataaacga taatctctat 660

ctgtatagaa gacgttcagg aagcatcatg agaacggaat ttgatctttc ctgggcaaga 720

gatattgttg aagtgttttc taagaaaata tcggattgtg tcttggctgg tttggatgtc 780

tccgttctgc gtattcgatt tgtcaatctt ttaaaagatt ataagcaaac tttagaatac 840

catcaattaa cagatactga ggaatataaa gatatttgtt tcagattaaa gttgtttttt 900

gatgcagaac aaagaaatgg taaaagttga 930

<210> 551
<211> 345
<212> DNA
<213> Streptococcus pneumoniae

<400> 551

gccaatataa ctaaaaaaag gagaaataca atggcaaaag caattacaga tgcaacattc 60

gaacaagaaa caaaagacgg tttggtctta gtagacttct gggcaacttg gtgtggtcca 120

tgtcgtatgc aaggtccaat cttggacaaa ttgtctgaag aactttcaga agatgtcttg 180

aaaatcgtta aaatggacgt tgatgaaaat ccaaacacag ctcgtgcttt tggaatcatg 240

tctattccaa ctcttctctt caaaaaagac ggccaagttg tcaaacaagt tgcaggtgtt 300

cacacagcag aacaaatcaa ggccatcatt gctgaattga gctaa 345

<210> 552
<211> 624
<212> DNA
<213> Streptococcus pneumoniae

<400> 552
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gctactgttg tagctcacga aatcaaaggg gaacttactt acgaagataa agttatccaa 120

aaaatcattg gtctttcact agaaaacgtt tcaggtcttt tgggaatcga tggtggtttc 180

ttctcaaatc ttaaagaaaa aatcgttaac agcgatgacg taacaagtgg tgttaacgta 240

gaagttggta aaacacaagt tgcagttgac ttaaacgtta ttgttgagta ccaaaaaaat 300

gttccagctt tatattcaga aatcagagaa atcgtatctt cagaagttgc taaaatgact 360

gacttggaaa ttgttgaaat caacgtaaac gttgtcgaca tcaaaactaa agaacagcat 420

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ttcacttcag aacaattcga aaaagctaaa tctggtcttg gatctggttt ctcaactgtt 540

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cacgaaaaca ctcgtgtaaa ctaa 624

<210> 553
<211> 1764
<212> DNA
<213> Streptococcus pneumoniae

<400> 553
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gtcattaaaa gtgtcatacc cctcgtggct tcccacttta tcgaccagta tctcagcaat 180

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<211> 480
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agtatagagg ctgaaaatcc agatgaagcc gaacgacttg taagagaaaa gtataagagt 420

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<211> 1014
<212> DNA
<213> Streptococcus pneumoniae

<400> 555
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agtttgagcg actataagac agattttcct ctgtttgaat tctccaaaat atttggagat 180

gaagagtatg gtttcccgct ttcagttact gttttacgct atggttctat ctaccgtttg 240

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gcgactcgta acgaaggtaa aaccaaggaa ttccgagcta tctttgataa gttaggctac 480

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gagtcatcag ctgaattaac cctggaagaa aaaaatagtc aatctcaccg tgccttagcc 960

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<211> 318
<212> DNA
<213> Streptococcus pneumoniae

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gctctaggag gaatgtactt ggttcgtaag caaatcgaaa aagaatttgc tgacaaccca 180

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aataaaaaga aaaaataa 318

<210> 557
<211> 312
<212> DNA
<213> Streptococcus pneumoniae

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aaaaccaaaa cagctcaagt tgtggctact ggacaaggtg ttcgtacctt gaacggtgac 180

ttggttgctc caagtgttaa aactggagat cgtgtcttag ttgaagccca cgcaggtctt 240

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<211> 477
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<213> Streptococcus pneumoniae

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<211> 1176
<212> DNA
<213> Streptococcus pneumoniae

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<211> 3720
<212> DNA
<213> Streptococcus pneumoniae

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<211> 1011
<212> DNA
<213> Streptococcus pneumoniae

<400> 561
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attggacaat ctcgtatggc catgttccta cttcgcaaga gacacatcgg agaagtgcaa 960

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<211> 837
<212> DNA
<213> Streptococcus pneumoniae

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agccgtgtct tgattgtgga tgacttcttg aaaggtggcg gaacggtcaa tggtatgatt 660

agtctcttgc gcgagttcga ctcagaactg gcaggtgtag cggtctttgc ggacaatgcc 720

caagaagaac gtgaaaagca gtttgactac aagtcactct tgaaggtaac caatattgat 780

gtcaagaacc aagccatcga tgttgaggtt ggcaatatct ttgacgaaga taaataa 837

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<211> 528
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<213> Streptococcus pneumoniae

<400> 564
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ggtctcaacg cctttgaacg cctcttggtc ggctcttcat ctgaatacat actccgccat 480

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ccagaagatt ttgaaattat tactagtgat gattcacaaa tctcacgctt tacccgtcca 960

aacttgacaa cgattgccca acctctttat gaccttggtg ccattagtat gcgtatgttg 1020

accaagatta tgcataagga agagttggaa gaacgtgaag ttctcttacc tcatggtttg 1080

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<210> 566
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<212> DNA
<213> Streptococcus pneumoniae

<400> 566
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gaaaatctat tacaacgtgc acaaacctac aatatgttgg ataatattct acgcgttgaa 180

attccaacac aaacagtgca agttgaaaaa aatggaaaga gaaaagaagt agaagaaaat 240

cgctttccag gttatgttct tgtagaaatg gtcatgacag atgaagcttg gtttgttgtt 300

cgaaacacac caaatgttac aggatttgtc ggatcacacg ggaacagatc aaaaccaact 360

ccattattgg aacaagaaat tcgcgacatt ttggtatcta tgggacaaac tgttcaagaa 420

tttgatttcg atgttgagat tggtcaaact gtacgtatta ttgatggtgc ttttgcagac 480

tacactggta agattacaga aattgataat aacaaagtga aaatgattat ctctatgttt 540

ggtaatgaca cagttgcaga agtaaatcta aaccaaatcg cagaattata a 591

<210> 567
<211> 2205
<212> DNA
<213> Streptococcus pneumoniae

<400> 567
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acaagtgaac tagaggactc tgattctact atcttacgtc gctctcgtag tgatcgaaaa 120

aaattagccc aagtaggtcc gattcgaaaa ttctggcgtc gttatcatct aacaaagatt 180

atccttatac taggtttgag tgcaggcttg ctagttggaa tctatttgtt tgctgtagcc 240

aagtcgacca atgtcaatga tttgcaaaat gccttgaaaa ctcggactct tatttttgac 300

cgtgaagaaa aagaggctgg tgccttgtct ggtcaaaagg gaacctatgt tgagctgact 360

gacatcagta aaaacttgca gaatgctgtt attgcgacag aagaccgttc tttctataaa 420

aatgacggga ttaactatgg ccgtttttttc ttggctattg tcactgctgg acgttcaggt 480

ggtggctcta ccattaccca acagctggct aaaaacgcct atttatcgca ggatcaaact 540

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<210> 568
<211> 1221
<212> DNA
<213> Streptococcus pneumoniae

<400> 568
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agttcaagtt tgaaatggca attatactta atgccagaag aaaaagtatt ggcgaaaggt 120

ttgattgaac gtatcggttt gaaagattca atttcaactg taaaatttga cggccgttct 180

gaacaacaaa ttttggatat tgaaaatcat atacaagccg ttaaaatttt attggatgac 240

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gttgctggtg gagaatattt caaagaatca acagttgttg agggagatgt tttagaaaaa 360

gttgaagagt tgagtttgtt ggctcctcta cacaacccgg ccaatgcagc aggtgttcgt 420

gccttcaagg aattgttgcc agacattacc agtgtagttg tttttgatac ttccttccac 480

acaagtatgc cagagaaagc ttatcgctac cctctaccaa caaaatatta cacagaaaac 540

aaggttcgta aatacggtgc tcatggtaca agtcaccagt ttgtagcagg agaagctgca 600

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ggctcaatta cagctgtgaa agccggcaaa tctgtagaca cttctatggg gttcactcct 720

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gtagcagaag ggaatcacga ggctagcttg gcttatgaaa tgtatgttga ccgtatccaa 960

aaacatatcg gtcagtacct tgcagtgcta aatggagcag atgccattgt tttcacagca 1020

ggtgtcggtg aaaatgcaga gagtttccgt cgtgatgtaa tctcagggat ttcgtggttt 1080

ggttgtgatg ttgatgatga aaagaatgtc tttggcgtta caggagacat ctcaacagag 1140

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gttgaacgct tgaaaaaata a 1221

<210> 569
<211> 1098
<212> DNA
<213> Streptococcus pneumoniae

<400> 569

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gctattgtgc gtattgtaaa aaccactatt tgtggaacag acctccatat tatcaaaggg 180

gatgttccta cttgccaaag tggtaccatt cttggccacg aagggattgg gattgttgaa 240

gaagttgggg aaggagtttc caacttcaaa aaaggtgaca aggtcttgat ttcttgcgtc 300

tgtgcctgtg gtaaatgcta ctactgtaaa aaaggaattt atgctcactg tgaagacgaa 360

gggggctgga ttttcggtca cttgattgat ggtatgcagg ctgaatatct acgtgtccct 420

catgcagata atactcttta ccatactcca gaagacttgt cagatgaagc tttggttatg 480

ctgtcagaca ttctgcctac tggatatgaa attggtgtct taaaagggaa agtagaacct 540

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caattctatt caccagctaa attgattatg gtagacctag acgataaccg cttggaaact 660

gccctatcat tcggtgcgac tcataaggtt aattcttcag accctgaaaa agccattaaa 720

gaaatttatg atttgacaga tggtcgtggt gtggatgtcg ctatcgaagc tgttggtatt 780

cctgcaacat ttgatttctg tcaaaagatt atcggtgtag acggaacggt tgccaactgt 840

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gtaacaactg gtttggtatc tacaaatacg actccacaat tgttgaaagc acttgaaagt 960

cataagattg aaccggaaaa attggtaact cactatttca aactcagtga aattgaaaaa 1020

gcctacgaag tcttcagtaa ggcagcagac caccatgcca ttaaggtcat tatcgaaaac 1080

gatatctcag aagcctaa 1098

<210> 570
<211> 1704
<212> DNA
<213> Streptococcus pneumoniae

<400> 570
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ctgatgacag gcttgatggt tgctagttca cttctgcaac cgcgttatct gcaggaagtc 120

ttaggcgccc tccttactgg gaaatatgaa gctatttata gtatcggggc ttggttgatt 180

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tatgctgata ttgaacaatt taatgcggga aatctagtcg ttcgaatgac aaatgatatc 360

aaccagattc agaacgttgt catgatgacc ttccaaattc ttttcagact tcccctcttg 420

ttcatcggtt cgtttatcct agcggttcaa accttacctt ctctgtggtg ggtgattgtt 480

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ggcgttcgtg tggtcaagtc ctttgtccaa gaaaaagagc aatttgctaa gtttacagag 660

gtctcagacg agcttcttgg tcaaaacctt tacattggtt atgccttttc agtagtggaa 720

ccctttatga tgttggttgg ttacgggcg gtcttcctct ctatttggct ggtcgcggga 780

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atggacaagg aaccgatgct gaaagatgtg agctttacta ttgaacctgg tcaaatggtt 1080

ggtgtagttg gagcgactgg tgcaggaaag tcaaccttgg ctcaattgat tccacgtctc 1140

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aaatcagagc gcttggtgca agaagctttg aataaggact tgaaggggac gacaaccatt 1560

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ggacgattga ttggtcaagg tacgcatgca gacttggttg ccaacaatgc cgtttaccgt 1680

gaaatctatg aaacacagaa atga 1704

<210> 571
<211> 1050
<212> DNA
<213> Streptococcus pneumoniae

<400> 571

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cgtatttggg gaaatcttcc cgagcaaatc aatgaaatta atacacacca tactaataag 180

cactacttta aagatgtcgt tctagacgaa aatatcattg cctacaccga cttagcagaa 240

acattgaaag atgtggatgc gattttgttt gttgtcccaa caaaagtgac acgacttgtt 300

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ctccgtagtg atatcgtcgt tgtttcaggg cctagtcatg cagaagagac cattgtgcgt 480

gacctaactt taataactgc tgcttctaaa gatttacaaa cagctcaata cgttcagaag 540

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cgagcagcct atgaactagc ccaagaactt ggagtctata tgcccattac acaggctatt 960

taccaagtta tttatcacgg aaccaatatc aaagatgcca tttatgacat catgaacaat 1020

gaatttaaag cagaaaatga gtggtcttaa 1050

<210> 572
<211> 1284
<212> DNA
<213> Streptococcus pneumoniae

<400> 572
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cttgctagct tgcttttggt agcttgcgga agcaaaactg ctgataagcc tgctgattct 120

ggttcatctg aagtcaaaga actcactgta tatgtagacg agggatataa gagctatatt 180

gaagaggttg ctaaagctta tgaaaaagaa gctggagtaa aagtcactct taaaactggt 240

gatgctctag gaggtcttga taaactttct cttgacaacc aatctggtaa tgtccctgat 300

gttatgatgg ctccatacga ccgtgtaggt agccttggtt ctgacggaca actttcagaa 360

gtgaaattga gcgatggtgc taaaacagac gacacaacta aatctcttgt aacagctgct 420

aatggtaaag tttacggtgc tcctgccgtt atcgagtcac ttgttatgta ctacaacaaa 480

gacttggtga aagatgctcc aaaaacattt gctgacttgg aaaaccttgc taaagatagc 540

aaatacgcat tcgctggtga agatggtaaa actactgcct tcctagctga ctggacaaac 600

ttctactata catatggact tcttgccggt aacggtgctt acgtctttgg ccaaaacggt 660

aaagacgcta aagacatcgg tcttgcaaac gacggttcta tcgtaggtat caactacgct 720

aaatcttggt acgaaaaatg gcctaaaggt atgcaagata cagaaggtgc tggaaactta 780

atccaaactc aattccaaga aggtaaaaca gctgctatca tcgacggacc ttggaaagct 840

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ggaaaagaat atgctgcatt cggtggtggt aaagcttggg tcattcctca agccgttaag 960

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aaaaacgatg agttgacaac agctgttatc aaacagttca agaacactca accactgcca 1140

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agtggtcaaa aagatgctaa aacagctgct aacgatgctg taacattgat caaagaaaca 1260

atcaaacaaa aatttggtga ataa 1284

<210> 573
<211> 1023
<212> DNA
<213> Streptococcus pneumoniae

<400> 573
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ttgattctca ttgagttgac aatcgtactt ggtatcttta tatttataat gggggttggt 120

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cctgtagaaa tcggtatcgc ggtaacttgg agagttgtcg ataccgctaa ggcagtcttc 540

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gatgaaggta gtctccgtgg ctctagcgaa attgttgcta accgtattcg tgaagaaatc 720

caaagtcgtg ttgaggatgc tggcttggaa atccttgaag cacgtatcac ttacctagct 780

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aatgaagggg aattggtaga acttgacgaa gaacgaaaag ctgccatggt ttcaaatctc 960

cttgtcgttc tttgtggcaa tcatgatgca caaccaattg tcaacacagg aagcctttac 1020

taa 1023

<210> 574
<211> 1041
<212> DNA
<213> Streptococcus pneumoniae

<400> 574
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gcagaaaaag actttacccg tgcagagtta gaatacctta ttggtctttc agctcacttg 120

aaagatttga aaaaacgcaa tattcaacac cactaccttg ctggcaagaa tatcgctctc 180

ctatttgaaa aaacatctac tcgtactcgt gcagcctttа caactgcggc tatcgacctt 240

ggtgctcacc cagaatacct cggagcaaat gatattcagt tgggtaaaaa agaatctact 300

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gacgaatggc acccaactca aatgctcgct gactacttga ctgttcaaga aaacttcggt 480

cgcttggaag gcttgacatt ggtatactgt ggtgatggac gtaacaacgt tgccaacagc 540

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taccaagtca atatggactt agttaaaaaa gcaggcaatg aaaacttgat cttcctacac 840

tgcttgccag cattccacga tactcacact gtttatggta aagacgttgc tgaaaaattt 900

ggtgtagaag aaatggaagt aacagacgaa gtcttccgca gcaagtacgc tcgccacttc 960

gatcaagcag aaaaccgtat gcacactatc aaagctgtta tggctgctac acttggtaac 1020

ctttatattc ctaaagtata a 1041

<210> 575
<211> 924
<212> DNA
<213> Streptococcus pneumoniae

<400> 575
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gcgattattg aacgctttgg gaaataccaa aaggttgcta atagcggtat tcatattcgc 180

ttgccttttg ggattgactc gattgcagca cggattcagt tgcgcttgtt gcaaagtgat 240

attgtggttg agactaagac caaggacaat gtgttcgtta tgatgaatgt agcgactcag 300

taccgtgtca acgagcagag cgtgacagat gcttactata aactcatacg tccagaatct 360

cagattaaat cttatatcga agatgctctt cgctcttctg ttccaaaatt aaccttggat 420

gaattgtttg agaaaaaaga tgagattgcc cttgaagttc aacaccaagt agcagaagaa 480

atgaccactt acggctacat tatcgtgaaa accttgatta ccaaggtcga accagatgca 540

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gaattggcgg aagctgacaa gattaaaatt gtcactgcag ctgaagcaga agcagaaaaa 660

gaccgccttc atggtgtggg gattgcccaa caacgtaagg cgattgtgga tggattggca 720

gagtctatca ccgaactcaa ggaagccaat gttggcatga cagaagaaca aatcatgtct 780

atcctcttga ccaaccagta tttggatacc ttgaatacct ttgcctctaa aggaaatcaa 840

actatctttt taccaaatac tccaaatggt gtggatgata tccgaacaca aatcttgtca 900

gcccttcgcg ctgagaagaa ataa 924

<210> 576
<211> 558
<212> DNA
<213> Streptococcus pneumoniae

<400> 576
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gatcatattg aggcctacat caaggcgatt ttagatcaat ctggtatcgt ggagttgcaa 180

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tcgattggtg agcgagtcag tcaagaaatt tatgaggata ttctccagct tttggttgag 420

caggaattga tgaccaagca ggagatgaat ttgctagaat cagtagcttt ggatcgcgtt 480

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gatagaaaag ggaagtaa 558

<210> 577
<211> 477
<212> DNA
<213> Streptococcus pneumoniae

<400> 577
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aagaatctag ccaaagaagc gactgctcaa gctgtaggtg aacttcgtgg taaacaaaaa 180

tcggaagaaa aagctcacgc tgagatgatt gcagaaggaa aagcaattaa agcacaactt 240

gaagcagaag aaactgttgt agaatttgtt gaaaaagttg gtccagatgg tcgtaccttt 300

ggttctatta ccaataagaa gattgcagaa gaattgcaaa agcaatttgg aattaagatt 360

gataaacgtc atattcaagt acaagctccg attcgagcgg ttggtttgat tgatgtgcca 420

gtgaaaatct atcaagatat cacaagtgta atcaatcttc gtgtgaaaga aggataa 477

<210> 578
<211> 564
<212> DNA
<213> Streptococcus pneumoniae

<400> 578
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caagagttgg atgcccgaat taacttaaaa gtttatcgtg aaaaaacggc taaagtggaa 180

gtaacgattc cgcttggatc tattactctc cgcgcagaag atgtatctca agatatgtat 240

ggttcaattg accttgtaac tgataaaatt gaacgtcaga ttcgtaaaaa taaaacaaaa 300

atcgagcgta aaaataaaaa taaggtagca actggtcaat tatttacaga tgctttggtg 360

gaagattcaa atattgtcca gtctaaagtt gttcgttcaa aacaaattga tttaaaacca 420

atggatttgg aagaagcaat tctacaaatg gatttattgg ggcatgattt ctttatctat 480

gtggatgttg aagatcagac aaccaatgtg atttatcgtc gtgaggatgg cgaaattggt 540

ttgttagagg ttaaagaatc ttaa 564

<210> 579
<211> 1080
<212> DNA
<213> Streptococcus pneumoniae

<400> 579
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gtagaaacag acggtgacat cgaaaaagcg attgaattgc ttcgtgaaaa aggtatggct 180

aaggcagcta agaaagctga ccgtgttgct gcagaaggtt tgactggtgt ttatgttaac 240

ggtaatgttg cagcagttat tgaagtaaac gctgaaactg acttcgttgc aaaaaacgct 300

caattcgttg aattggtaaa tactacagct aaagtcattg ctgaaggaaa acctgctaac 360

aacgaagaag ctcttgcttt gataatgcct tcaggtgaaa ctcttgaagc tgcatacgta 420

tctgcaacag caactatcgg agagaaaatc tcattccgtc gctttgcatt gattgaaaaa 480

acagacgcac aacactttgg agcataccaa cataacggtg gacgtatcgg tgttatttca 540

gttgttgaag gtggagacga agcacttgct aaacaattgt caatgcacat cgcagcgatg 600

aaaccaacag ttctttctta caaagaattg gatgagcaat tcgttaaaga tgagttggca 660

caattgaatc acgttatcga ccaagacaac gaaagccgtg caatggttaa taaaccagct 720

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tcagttaacg cttcggtagt tgagtttgct cgctttgaag ttggtgaagg tatcgagaaa 1020

gctgcaaacg acttcgaagc tgaagttgca gctacaatgg cagcagcctt gaataactaa 1080

<210> 580
<211> 873
<212> DNA
<213> Streptococcus pneumoniae

<400> 580
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cttgaggctg gtgtacactt tggtcaccaa actcgtcgct ggaatcctaa gatggctaag 180

tacatcttta ctgaacgtaa cggaatccac gttatcgact tgcaacaaac tgtaaaatac 240

gctgaccaag catacgactt catgcgtgat gcagcagcta acgatgcagt tgtattgttc 300

gttggtacta agaaacaagc agctgatgca gttgctgaag aagcagtacg ttcaggtcaa 360

tacttcatca accaccgttg gttgggtgga actcttacaa actggggaac aatccaaaaa 420

cgtatcgctc gtttgaaaga aattaaacgt atggaagaag atggaacttt cgaagttctt 480

cctaagaaag aagttgcact tcttaacaaa caacgtgcgc gtcttgaaaa attcttgggc 540

ggtatcgaag atatgcctcg tatcccagat gtgatgtacg tagttgaccc acataaagag 600

caaatcgctg ttaaagaagc taaaaaattg ggaatcccag ttgtagcgat ggttgacacc 660

aatactgatc cagatgatat cgatgtaatc atcccagcta acgatgacgc tatccgtgct 720

gttaaattga tcacagctaa attggctgac gctattatcg aaggacgtca aggtgaggat 780

gcagtagcag ttgaagcaga atttgcagct ttagaaactc aagcagattc aattgaagaa 840

atcgttgaag ttgtagaagg cgacaacgct taa 873

<210> 581
<211> 834
<212> DNA
<213> Streptococcus pneumoniae

<400> 581
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actgttctgc ttgtgtcagc tctcttagcg acgacttatt caagtacaat tgtgacaaaa 120

ttaggagatg gaatctcatt ggttgataga gttgtacaaa aacctttca gtggtttgat 180

tctgtcaaat cagatttggc tcatttgaca cgaacatata atgaaaatga aagtttgaag 240

aaacagcttt accaattaga agttaaatca aatgaggtgg aaagtttaaa gacagaaaat 300

gaacaactgc gccaattgct tgatatgaag tctaaattgc aagccacaaa gactttagca 360

gcagatgtta ttatgcgttc tccggtatct tggaagcagg agttgacctt agatgcaggt 420

agatcaaaag gtgcttctga gaacatgtta gctattgcaa atggtggctt gattgggagt 480

gtttcaaaag tagaggagaa ctctactata gtcaaccttc tgacaaatac ggaaaatgct 540

gataagattt ctgttaaaat tcaacatggc tctactacaa tttatggaat tattattggc 600

tatgacaagg aaaatgacgt tcttaaaatt agccaattaa atagtaatag cgatattagt 660

gcgggagata aggtgactac tggtggatta ggaaacttta acgttgctga tattcctgtt 720

ggtgaagtgg ttgccacaac gcatagtaca gactatttga cacgagaagt aactgttaaa 780

ttgagtgcag atactcataa tgtagatgtg atagaattag tggggaattc ataa 834

<210> 582
<211> 846
<212> DNA
<213> Streptococcus pneumoniae

<400> 582
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aaagaaaatc agaactacta cgatgtgaag gatattacgt ttcacgtgaa acgtggagaa 120

tggctttcga ttgtagggca taatggtagt ggtaaatcaa cgacggttcg attaattgat 180

ggcttactgg aagcagaatc cggagagatt gtaattgatg gccaacgttt gactgaggaa 240

aatgtttgga atatacgtcg tcaaatcggt atggtttttc aaaatccaga caatcaattt 300

gttggagcga ctgttgaaga tgatgttgct tttggtttgg aaaatcaggg actttctcgt 360

caagaaatga aaaagagagt ggaagaagct ctggctttag ttggcatgtt ggactttaaa 420

aagagagagc cagcgcgtct atcaggtggc caaaagcaac gtgtggccat tgcaggtgtt 480

gtagccctaa gaccagctat tttaatctta gatgaagcaa cgagtatgtt ggatcctgag 540

gggcgtagag aacttattgg gacagtaaaa ggaattcgaa aagactatga tatgacggtc 600

atttctatta cccatgattt ggaagaagtc gccatgagtg atcgcgtatt ggtcatgaaa 660

aaaggggaaa ttgaatcaac tagtagtcca agggagcttt tctctcgaaa tgatttagat 720

caaattggat tagacgatcc ttttgctaat caattaaaaa aatctttgag ccagaatggc 780

tatgatttac ctgaaaatta tttgacagaa agtgagctag aggataagct atgggaattg 840

ctctag 846

<210> 583
<211> 840
<212> DNA
<213> Streptococcus pneumoniae

<400> 583
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atcaatcagg gattgagttt agatgaattg cagaaaaaga cagaaatcca gttagatatg 120

ttggaagcaa tggaagcaga cgatttcgat caacttccaa gtccttttta cacgcgttct 180

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gattctggga gtatgattac ttatgaggaa gtagatgttg atgaagatga gttgacaggt 300

cgtagacgtt caagtaagaa aaagaagaaa aaaacatcat ttttaccttt attttatttt 360

atccttttg ctttatcgat tttaattttt gtgacttatt atgtttggaa ctatattcaa 420

actcaaccag aggagccttc tctttctaat tacagtgtgg ttcaatcaac aagttcaact 480

agctctgttc cccactcctc aagtagtagt tcttctagta tagaatcagc tataagtgta 540

tcaggcgaag gaaatcatgt agaaatcgct tataagacaa gtaaggaaac agttaaattg 600

caattggcag tttcagatgt tacaagttgg gtcagtgttt cagaaagcga acttgagggc 660

ggtgtaacct tatcgccaaa gaagaaaagt gcagaagcaa cagttgcaac taaaagtcct 720

gtaacaatta cgttaggtgt tgtaaaaggt gttgatttga cagtagataa tcagactgtt 780

gatttatcga aattaacagc tcagactgga caaatcactg taacctttac taaaaattaa 840

<210> 584
<211> 1020
<212> DNA
<213> Streptococcus pneumoniae

<400> 584
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tctgatttaa agctgtttgc cctttcttct aataaagaat tggcagaacg tgtggcgcag 120

gagattggga tagagttggg gaaatcaagt gttcgccaat tttcagatgg agagattcag 180

gtcaacattg aagaatcaat ccgtgggaaa cacgtcttta tcttacaatc aactagttcg 240

cctgtaaatg acaatctgct tgaaattttg attatggtag atgctttgaa gcgtgcgagt 300

gcagaatctg tcaatgttgt catgccttac tatgggtatg cacgtcagga tagaaaggcg 360

agagcgcgtg agccaatcac ttcaaaactt gtcgcaaata tgcttgaagt agctggagtg 420

gatcgtttat tgaccatcga cttgcatgct gcgcaaattc aaggattctt tgatattcct 480

gtggatcatt tgatgggtgc tcctctgatt gcagattatt ttgagcgtcg tggtatggtt 540

ggttctgact atgtggttgt cagcccggac catggagggg tgactcgtgc tcgtaagttg 600

gcagaatttt tgaaaacatc tatcgctatt attgataaac gtcgtagcgt tgataagatg 660

aatactagtg aagttatgaa tatcatcggt aaggttgaag gcaagacttg tatcttgatt 720

gatgatatga ttgataccgc tggaacgatt tgtcatgcgg cagatgctct tgcggaagct 780

ggtgctgttg aagtctatgc aagctgtacg cacccagttc tttctggtcc tgctacggac 840

aatatccaaa aatcagctat taagaaattg gttgttttgg ataccatcta tctgccagaa 900

gagcgtttga ttgataagat tgagcagatt tcaatcgctc atctcctagg ggatgctatc 960

gtacgtattc atgaaaaacg accactttct ccacttttcg atattgagaa aaaaatttaa 1020

<210> 585
<211> 672
<212> DNA
<213> Streptococcus pneumoniae

<400> 585
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ttgattcgtc agtttgacca ggctatttcg gagattcctg gggtcttgcg tttgaccttg 120

ggggaacctg attttacaac gccagaccat gtcaaggagg cgggcaagcg agcgattgat 180

cagaaccaat cctactatac agggatgagt ggtctgctga ctctacgtca ggcagccagt 240

gactttgtta aggaaaagta ccaactggac tatgctcctg aaaatgaaat cttggttaca 300

attggggcga cagaggcttt atctgcgact ttgacggcta ttttggaaga gggagacaag 360

gtacttttgc cagctcctgc ttatccaggc tatgaaccga ttgttaactt agttggggca 420

gaaattgttg agattgatac gactgaaaat ggttttgtct tgactcctga gatgttggag 480

aaggccattt tggagcaggg tgataagctc aaggcggtta ttctcaacta tccagccaat 540

ccgacaggaa ttacctacag tcgagagcag ttagaggcct tggcagctgt tttacgcaag 600

tacgaaattt ttgttgtctg tgatgaggtt tactcagaat tgacctacac aggcgaagcc 660

atgtgtctct ag 672

<210> 586

<211> 1302
<212> DNA
<213> Streptococcus pneumoniae

<400> 586
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taccgtgctt ggcttgaggt ggaaatcctc tctgacgagg catgggctga gttgggggaa 120

atccctaagg aagatgtggc tttgattcgc aagaaggcgg actttgacat cgaccgtatt 180

ttggaaattg agcaggagac gcgccacgat gtggtggctt tcacgcgtgc ggtttctgag 240

actcttggtg aagagcgcaa gtgggttcac tatgggttaa cttctactga cgtggtggat 300

actgcttatg gttacctcta caagcaggcc aacgacatca tccgtcgtga ccttgaaaac 360

ttcactaata tcatcgctga caaggccaag gagcacaagt tcaccatcat gatggggcgt 420

actcatggtg tgcacgctga gccgacaacc tttggtctta aattagcaac ttggtacagc 480

gaaatgaaac gcaatatcga gcgcttcgag catgcggctg ctggtgtaga agctggtaag 540

atttctggtg cggttgggaa ctttgccaat atcccaccat ttgtagagga gtatgtctgc 600

gataaacttg gcatccgtgc ccaagaaatc tctacacaag tccttcctcg tgaccttcac 660

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attcgtggtc tacaaaaatc tgagcaacgc gaagtagaag agttctttgc taaagggcaa 780

aaagggtctt cagcaatgcc tcacaaacgc aacccaatcg gttctgaaaa tatgactggt 840

ctggcgcgtg tcattcgtgg tcacatgatt acggcttatg aaaacgtcgc tctctggcat 900

gaacgcgata tttctcactc atcagctgag cgtatcatca caccagatac gaccattttg 960

attgactaca tgctcaaccg ttttggaaat atcgtcaaga acttgacagt cttcccagaa 1020

aatatgatcc gaaacatgaa ctcgactttt ggtcttatct ttagccaacg ggctatgttg 1080

acattgattg aaaaaggcat gacccgtgag caagcctatg acttggtgca accaaaaaca 1140

gcctactctt gggacaacca agtagacttt aaaccacttc ttgaggcaga ttcagaagta 1200

acatcacgtc tcacacaaga agaaatcgat gaaatcttca acccagttta ttacaccaaa 1260

cgagtggatg atatctttga acgtcttgga ctaggtgatt aa 1302

<210> 587
<211> 918
<212> DNA
<213> Streptococcus pneumoniae

<400> 587
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caaatctgtg atgagttgac gatcgtttca tctgcaggtt cccctgtatt tgctggtttc 120

attactggtt taatcatggg agatgtgact actggtttac ttatcggtgg taacttgcaa 180

ctgttcgttc ttgggggttgg taccttcggt ggtgcttctc gtatcgacgc aacttctggt 240

gcggttcttg cgacagcctt ctctgtttca caaggaattg atgcaccgct tgccattact 300

acaatcgctg taccagtagc agctctcttg acttacttcg acgttcttgg tcgtatgact 360

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gaacgcaact acttgcttgg tgcgattccg tgggctctat ctcgtgccct tccagtcttc 480

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aaatgggttg cagatggctt gacacttgca ggacgtatgc ttccaggtct tggatttgca 600

atcttgcttc gttaccttcc agttaaacgt aaccttcact accttgctat gggatttggt 660

ttgacagcta tgttgactgt tctttactca tatgtaacag gtcttggtgg cgctgttgct 720

ggtatcgtag gtactcttcc tgctgaagtt gctgaaaaaa ttggtttcgt gaacaacttc 780

aaaggtttgt ctatgattgg tatttctatc gtaggtattt tccttgcagt gcttcacttc 840

aaaaatagcc aaaaagtagc tgtagcagca ccttctacac catcagaaag tggggaaatc 900

gaagatgacg aattctaa 918

<210> 588
<211> 855
<212> DNA
<213> Streptococcus pneumoniae

<400> 588
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cttacaaaag aagattttaa tcaaatcaac aaacgtagct tgtttacttt ccaattaggt 120

tggaactacg aacgtatgca agcttctggt tacctttaca tgatcttgcc tcagttgcgt 180

aaaatgtatg gtgatggaac tcctgaattg aaagaaatga tgaaagttca tactcaattc 240

ttcaatactt caccattctt ccataccatt atcgctggtt ttgaccttgc catggaagaa 300

aaagatggtg taggttcaaa agacgccgtt aacggtatca agacaggttt gatgggacca 360

ttcgctcctc ttggggatac aatctttggt tcacttgtac ctgctatcat ggggtcagtc 420

gcagcaacta tggctatcgc tggccaacct tgggggatct tcctttggat tgcagttgca 480

gtagcgtatg acatcttccg ttggaaacag ttggaatttg cttacaaaga aggggttaac 540

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gtcttcatga tgggtgctct tgtagcaaca gtgattaact ttgaaatttc ttacaagttg 660

ccaatcggtg aaaagatgat tgatttccaa gacatcttga accaaatctt cccacgtttg 720

cttccagcaa tctttactgc ctttatcttc tggttgcttg gtaagaaagg tatgaactct 780

actaaagcta tcggtattat tatcgtactt gctttggctc tttctgccct tggtcacttt 840

gcacttggaa tgtaa 855

<210> 589
<211> 1182
<212> DNA
<213> Streptococcus pneumoniae

<400> 589
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atcactacgc gtgaaatcta ccaacagcct gatgtatgga gagaagcttt tgaattttat 120

caagcaaaac gtgaagaaat tgcagccttc ctacaagaaa tcgctgataa acatgactat 180

attaaggtta tcttgacagg tgctgggact tctgcttatg tgggagatac cttgctacct 240

tattttaagg aagtctatga cgaacgcaaa tggaatttca atgctattgc gacaacagat 300

atcgttgcca atccagcaac ctatttgaaa aaagatgtgg caactgtcct tgtgtctttt 360

gctcgtagtg ggaattcgcc tgaaagtttg gcgactgttg atttggccaa atccttggtg 420

gatgagcttt atcaagtgac gattacttgt gcagcagatg gtaaattggc tcttcaagct 480

cacggtgatg atcgtaatct cttgctcttg caaccagctg tctctaatga tgctggattt 540

gccatgactt ctagctttac gtctatgatg ttgacaactc tcttggtctt tgatcctaca 600

gaatttgctg ttaagtctga acgttttgaa gttgtatcta gtcttgcccg taaagtttta 660

gacaaggcag aagatgtcaa agagctcgtt gatttagact ttaaccgtgt catctatcta 720

ggcgctggtc ctttctttgg acttgctcat gaagctcagc tcaagatttt ggaattaact 780

gctggtcaag ttgcgaccat gtatgaaagc ccagttggct tccgtcacgg tccaaaatct 840

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gtcttgaatg atatttaccg tgtcttccct tacatcgttt atgcccaact ctttgcttta 1080

ttgacttcac tcaaggtaga aaataaacca gatacaccgt ctcctacagg tacagtaaac 1140

cgtgtagtac aaggtgtcat aattcacgaa tatcaaaagt aa 1182

<210> 590
<211> 654
<212> DNA
<213> Streptococcus pneumoniae

<400> 590
ctatttccac cgaaatatta tttatatcag gaggacattc atatgtcacg ttatacagga 60

ccatcttgga aacaagctcg tcgtcttggc ctttcactta caggtacagg taaagaattg 120

gcacgtcgta actacgtacc aggacaacac ggaccaaaca accgttctaa attgtcagaa 180

tacggtttgc aattggctga aaaacaaaaa cttcgtttca cttacggtgt aggtgaaaaa 240

caattccgta acttgttcgt acaagctaca aaaatcaaag gcggaatcct aggtttcaac 300

tttatgcttc ttttggaacg tcgtttggat aacgttgttt accgtcttgg tctcgcgact 360

actcgtcgtc aagctcgtca attcgtaaac cacggtcaca tccttgttga cgggaaacgc 420

gttgatatcc catcataccg cgtaactcca ggtcaagtga tctcagttcg tgaaaaatca 480

ttgaaagttc cagcaatcct tgaagcagta gaagctactc ttggacgtcc agcattcgta 540

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aacccagaaa tcaacgaagc acttgtcgtt gaattctaca acaaaatgtt gtaa 654

<210> 591
<211> 1032
<212> DNA
<213> Streptococcus pneumoniae

<400> 591
ataaaaaatt tagaaaattt aagaatagaa aagagaacaa atcttatggc aaaagatatt 60

cgtgtcttac tttactacct ttatactcca attgaaaatg cagagcaatt tgctgcagac 120

cacttggctt tctgtaaatc aatcggcctt aaaggccgta tcctagtcgc tgacgaggga 180

attaacggaa cagtttcagg tgactatgaa acaactcaaa aatacatgga ctacgttcac 240

agccttccag gaatggaaga actctggttc aagattgacg aagaaaatga acaagccttc 300

aagaagatgt ttgttcgcta caagaaagaa attgtccacc ttggtttgga agacaacgac 360

tttgacaatg acatcaaccc acttgaaaca acaggtgctt acttgtctcc aaaagagttc 420

aaagaagcgc ttcttgataa agataccgtt gtccttgaca cacgtaacga ttatgagtac 480

gacctaggac atttccgtgg agctattcgc ccagatattc gcaacttccg tgagttacca 540

caatgggtcc gtgataacaa ggaaaaattc atggacaagc gtgtcgtggt ttactgtaca 600

ggtggcgttc gctgtgagaa attctcaggc tggatggtcc gtgaaggcta caaagatgtc 660

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ccaactatcg tagggaaaga ctggtttgat ggaacaccat gtgaacgtta tgtcaactgt 840

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cgtggatgct cacacgagtg ccgtgttcac ccacgtaacc gctatgtttc aaaaaatgaa 960

ttgacacaag ctgaagttat cgagcgccta gccgctatcg gtgaaagctt ggatcaagca 1020

gctactgtat aa 1032

<210> 592
<211> 216
<212> PRT
<213> Streptococcus pneumoniae

<400> 592

Met Asn Ile Ala Val Ile Gly Leu Gly His Val Gly Leu Ala Tyr Ala
1 5 10 15

Leu Leu Phe Ala Ser Lys Tyr Lys Val Val Ala Tyr Asp Ile Asp Ser
20 25 30

Val Lys Ile Asn Asn Leu Lys Lys Gly Ile Leu Pro Ser Lys Asn Glu
35 40 45

Glu Leu Met Lys Phe Phe Cys Glu Asn Asn Leu Asn Ile Thr Phe Phe
50 55 60

Asp Thr Phe Ser Glu Ile Lys Asn Asn Ile Asp Tyr Tyr Ile Ile Ala
65 70 75 80

Leu Pro Thr Asp Tyr Asp Glu Lys Ile Gly Ser Phe Asn Thr Tyr Glu
85 90 95

```
Ile Glu Gln Thr Val Ser Lys Ile Leu Arg Val Lys Pro Asn Gly Lys
            100                 105                 110

Ile Ile Leu Lys Ser Thr Val Pro Ile Gly Phe Ser Asn Lys Leu Lys
        115                 120                 125

Arg Leu Phe Asp Thr Lys Asn Ile Ile Phe Val Pro Glu Phe Leu Arg
    130                 135                 140

Glu Gly Cys Ser Ile Tyr Asp Asn Leu Tyr Pro Ser Arg Ile Val Val
145                 150                 155                 160

Gly Asp Glu Thr Val Glu Gly Arg Lys Ile Ala Glu Leu Phe Leu Ser
                165                 170                 175

Ile Ser Thr His Ser Thr Ala Asn Ile Lys Asn Val Met Leu Val Ser
            180                 185                 190

Pro Thr Glu Ala Glu Ala Ile Lys Leu Phe Ser Asn Thr Phe Leu Ala
        195                 200                 205

Leu Arg Val Ala Phe Leu Met Asn
    210                 215

<210>  593
<211>  234
<212>  PRT
<213>  Streptococcus pneumoniae

<400>  593

Met Val Leu Arg Gly Val Pro Met Ser Gln Ile Asp Leu Gln Lys Leu
1               5                   10                  15

Thr Lys Lys Asn Gln Glu Phe Val His Ile Ala Thr Gln Gln Phe Ile
            20                  25                  30

Lys Asp Gly Lys Thr Asp Ala Glu Ile Gln Thr Ile Phe Glu Glu Val
        35                  40                  45

Ile Pro Gln Ile Leu Glu Glu Gln Ser Lys Gly Thr Thr Ala Arg Ser
    50                  55                  60
```

```
Leu Tyr Gly Ala Pro Thr His Trp Ala His Ser Phe Thr Val Lys Glu
65                  70                  75                  80

Gln Tyr Glu Lys Glu His Pro Lys Glu Asn Asp Asp Pro Lys Leu Met
                85                  90                  95

Ile Met Asp Ser Ala Leu Phe Ile Thr Ser Leu Phe Ala Leu Val Ser
            100                 105                 110

Ala Leu Thr Thr Phe Phe Ala Ala Asp Gln Ala Phe Gly Tyr Gly Leu
        115                 120                 125

Ile Thr Leu Leu Leu Val Gly Leu Val Gly Gly Phe Ala Phe Tyr Leu
    130                 135                 140

Met Tyr Tyr Phe Val Tyr Gln Tyr Tyr Gly Pro Asp Met Asp Arg Ser
145                 150                 155                 160

Gln Arg Pro Pro Phe Trp Lys Ser Val Leu Val Ile Leu Ala Ser Met
                165                 170                 175

Phe Leu Trp Leu Leu Val Phe Phe Ala Thr Ser Phe Leu Pro Ala Ser
            180                 185                 190

Leu Asn Pro Val Leu Asp Pro Leu Pro Leu Ala Ile Ile Gly Ala Ala
        195                 200                 205

Leu Leu Ala Leu Arg Phe Tyr Leu Lys Lys Arg Leu Asn Ile Arg Ser
    210                 215                 220

Ala Ser Ala Gly Pro Thr Arg Tyr Gln Glu
225                 230

<210>  594
<211>  314
<212>  PRT
<213>  Streptococcus pneumoniae

<400>  594

Met Lys Gln Val Phe Leu Ser Thr Thr Thr Glu Phe Lys Glu Ile Asp
1               5                   10                  15
```

```
Thr Leu Glu Pro Gly Thr Trp Ile Asn Leu Val Asn Pro Thr Gln Asn
            20                  25                  30

Glu Ser Leu Glu Ile Ala Asn Thr Phe Asp Ile Asp Ile Ala Asp Leu
        35                  40                  45

Arg Ala Pro Leu Asp Ala Glu Glu Met Ser Arg Ile Thr Ile Glu Asp
    50                  55                  60

Glu Tyr Thr Leu Ile Ile Val Asp Val Pro Val Thr Glu Glu Arg Asn
65                  70                  75                  80

Asn Arg Thr Tyr Tyr Val Thr Ile Pro Leu Gly Ile Ile Ile Thr Glu
                85                  90                  95

Glu Thr Ile Ile Thr Thr Cys Leu Glu Pro Leu Pro Val Leu Asp Val
            100                 105                 110

Phe Ile Asn Arg Arg Leu Arg Asn Phe Tyr Thr Phe Met Arg Ser Arg
        115                 120                 125

Phe Ile Phe Gln Ile Leu Tyr Arg Asn Ala Glu Leu Tyr Leu Thr Ala
    130                 135                 140

Leu Arg Ser Ile Asp Arg Lys Ser Glu Gln Ile Glu Ser Gln Leu His
145                 150                 155                 160

Gln Ser Thr Arg Asn Glu Glu Leu Ile Glu Leu Met Glu Leu Glu Lys
                165                 170                 175

Thr Ile Val Tyr Phe Lys Ala Ser Leu Lys Thr Asn Glu Arg Val Ile
            180                 185                 190

Lys Lys Leu Thr Ser Ser Thr Ser Asn Ile Lys Lys Tyr Leu Glu Asp
        195                 200                 205

Glu Asp Leu Leu Glu Asp Thr Leu Ile Glu Thr Gln Gln Ala Ile Glu
    210                 215                 220

Met Ala Asp Ile Tyr Gly Asn Val Leu His Ser Met Thr Glu Thr Phe
225                 230                 235                 240
```

```
Ala Ser Ile Ile Ser Asn Asn Gln Asn Asn Ile Met Lys Thr Leu Ala
                245                 250                 255

Leu Val Thr Ile Val Met Ser Ile Pro Thr Met Val Phe Ser Ala Tyr
            260                 265                 270

Gly Met Asn Phe Lys Asp Asn Glu Ile Pro Leu Asn Gly Glu Pro Asn
        275                 280                 285

Ala Phe Trp Leu Ile Val Phe Ile Ala Phe Ala Met Ser Val Ser Leu
    290                 295                 300

Thr Leu Tyr Leu Ile His Lys Lys Trp Phe
305                 310

<210>  595
<211>  102
<212>  PRT
<213>  Streptococcus pneumoniae

<400>  595

Met Ala Asn Lys Lys Ile Arg Ile Arg Leu Lys Ala Tyr Glu His Arg
1               5                   10                  15

Thr Leu Asp Thr Ala Ala Ala Lys Ile Val Glu Ser Ala Thr Arg Thr
            20                  25                  30

Gly Ala Gln Val Ala Gly Pro Ile Pro Leu Pro Thr Glu Arg Ser Leu
        35                  40                  45

Tyr Thr Ile Ile Arg Ala Thr His Lys Tyr Lys Asp Ser Arg Glu Gln
    50                  55                  60

Phe Glu Met Arg Thr His Lys Arg Leu Ile Asp Ile Val Asn Pro Thr
65                  70                  75                  80

Gln Lys Thr Val Asp Ala Leu Met Lys Leu Asp Leu Pro Ser Gly Val
                85                  90                  95

Asn Val Glu Ile Lys Leu
            100
```

<210> 596
<211> 208
<212> PRT
<213> Streptococcus pneumoniae

<400> 596

Met Thr Lys Gly Ile Leu Gly Lys Lys Val Gly Met Thr Gln Ile Phe
1 5 10 15

Thr Glu Ala Gly Glu Leu Ile Pro Val Thr Val Ile Glu Ala Thr Pro
20 25 30

Asn Val Val Leu Gln Val Lys Thr Val Glu Thr Asp Gly Tyr Asn Ala
35 40 45

Ile Gln Val Gly Phe Asp Asp Lys Arg Glu Val Leu Ser Asn Lys Pro
50 55 60

Ala Lys Gly His Val Ala Lys Ala Asn Thr Ala Pro Lys Arg Phe Ile
65 70 75 80

Arg Glu Phe Lys Asn Val Glu Gly Leu Glu Val Gly Ala Glu Ile Thr
85 90 95

Val Glu Thr Phe Ala Ala Gly Asp Val Val Asp Val Thr Gly Thr Ser
100 105 110

Lys Gly Lys Gly Phe Gln Gly Val Ile Lys Arg His Gly Gln Ser Arg
115 120 125

Gly Pro Met Ala His Gly Ser Arg Tyr His Arg Arg Pro Gly Ser Met
130 135 140

Gly Pro Val Ala Pro Asn Arg Val Phe Lys Gly Lys Asn Leu Ala Gly
145 150 155 160

Arg Met Gly Gly Asp Arg Val Thr Ile Gln Asn Leu Glu Val Val Gln
165 170 175

Val Val Pro Glu Lys Asn Val Ile Leu Ile Lys Gly Asn Val Pro Gly
180 185 190

Ala Lys Lys Ser Leu Ile Thr Ile Lys Ser Ala Val Lys Ala Gly Lys
195 200 205

<210> 597
<211> 207
<212> PRT
<213> Streptococcus pneumoniae

<400> 597

Met Ala Asn Val Thr Leu Phe Asp Gln Thr Gly Lys Glu Ala Gly Gln
1 5 10 15

Val Val Leu Ser Asp Ala Val Phe Gly Ile Glu Pro Asn Glu Ser Val
20 25 30

Val Phe Asp Val Ile Ile Ser Gln Arg Ala Ser Leu Arg Gln Gly Thr
35 40 45

His Ala Val Lys Asn Arg Ser Ala Val Ser Gly Gly Gly Arg Lys Pro
50 55 60

Trp Arg Gln Lys Gly Thr Gly Arg Ala Arg Gln Gly Ser Ile Arg Ser
65 70 75 80

Pro Gln Trp Arg Gly Gly Gly Val Val Phe Gly Pro Thr Pro Arg Ser
85 90 95

Tyr Gly Tyr Lys Leu Pro Gln Lys Val Arg Arg Leu Ala Leu Lys Ser
100 105 110

Val Tyr Ser Glu Lys Val Ala Glu Asn Lys Phe Val Ala Val Asp Ala
115 120 125

Leu Ser Phe Thr Ala Pro Lys Thr Ala Glu Phe Ala Lys Val Leu Ala
130 135 140

Ala Leu Ser Ile Asp Ser Lys Val Leu Val Ile Leu Glu Glu Gly Asn
145 150 155 160

Glu Phe Ala Ala Leu Ser Ala Arg Asn Leu Pro Asn Val Lys Val Ala
165 170 175

```
Thr Ala Thr Thr Ala Ser Val Leu Asp Ile Ala Asn Ser Asp Lys Leu
            180                 185                 190

Leu Val Thr Gln Ala Ala Ile Ser Lys Ile Glu Glu Val Leu Ala
        195                 200                 205


<210>  598
<211>  98
<212>  PRT
<213>  Streptococcus pneumoniae

<400>  598

Met Asn Leu Tyr Asp Val Ile Lys Lys Pro Val Ile Thr Glu Ser Ser
1               5                   10                  15

Met Ala Gln Leu Glu Ala Gly Lys Tyr Val Phe Glu Val Asp Thr Arg
            20                  25                  30

Ala His Lys Leu Leu Ile Lys Gln Ala Val Glu Ala Ala Phe Glu Gly
        35                  40                  45

Val Lys Val Ala Asn Val Asn Thr Ile Asn Val Lys Pro Lys Ala Lys
    50                  55                  60

Arg Val Gly Arg Tyr Thr Gly Phe Thr Asn Lys Thr Lys Lys Ala Ile
65                  70                  75                  80

Ile Thr Leu Thr Ala Asp Ser Lys Ala Ile Glu Leu Phe Ala Ala Glu
                85                  90                  95

Ala Glu


<210>  599
<211>  277
<212>  PRT
<213>  Streptococcus pneumoniae

<400>  599

Met Gly Ile Arg Val Tyr Lys Pro Thr Thr Asn Gly Arg Arg Asn Met
1               5                   10                  15
```

```
Thr Ser Leu Asp Phe Ala Glu Ile Thr Thr Ser Thr Pro Glu Lys Ser
            20                  25                  30

Leu Leu Val Ala Leu Lys Ser Lys Ala Gly Arg Asn Asn Asn Gly Arg
        35                  40                  45

Ile Thr Val Arg His Gln Gly Gly Gly His Lys Arg Phe Tyr Arg Leu
    50                  55                  60

Val Asp Phe Lys Arg Asn Lys Asp Asn Val Glu Ala Val Val Lys Thr
65                  70                  75                  80

Ile Glu Tyr Asp Pro Asn Arg Ser Ala Asn Ile Ala Leu Val His Tyr
                85                  90                  95

Thr Asp Gly Val Lys Ala Tyr Ile Ile Ala Pro Lys Gly Leu Glu Val
            100                 105                 110

Gly Gln Arg Ile Val Ser Gly Pro Glu Ala Asp Ile Lys Val Gly Asn
        115                 120                 125

Ala Leu Pro Leu Ala Asn Ile Pro Val Gly Thr Leu Ile His Asn Ile
    130                 135                 140

Glu Leu Lys Pro Gly Arg Gly Gly Glu Leu Val Arg Ala Ala Gly Ala
145                 150                 155                 160

Ser Ala Gln Val Leu Gly Ser Glu Gly Lys Tyr Val Leu Val Arg Leu
                165                 170                 175

Gln Ser Gly Glu Val Arg Met Ile Leu Gly Thr Cys Arg Ala Thr Val
            180                 185                 190

Gly Val Val Gly Asn Glu Gln His Gly Leu Val Asn Leu Gly Lys Ala
        195                 200                 205

Gly Arg Ser Arg Trp Lys Gly Ile Arg Pro Thr Val Arg Gly Ser Val
    210                 215                 220

Met Asn Pro Asn Asp His Pro His Gly Gly Gly Glu Gly Lys Ala Pro
225                 230                 235                 240
```

```
Val Gly Arg Lys Ala Pro Ser Thr Pro Trp Gly Lys Pro Ala Leu Gly
                245                 250                 255

Leu Lys Thr Arg Asn Lys Lys Ala Lys Ser Asp Lys Leu Ile Val Arg
            260                 265                 270

Arg Arg Asn Glu Lys
        275
```

<210> 600
<211> 93
<212> PRT
<213> Streptococcus pneumoniae

<400> 600

```
Met Gly Arg Ser Leu Lys Lys Gly Pro Phe Val Asp Glu His Leu Met
1               5                   10                  15

Lys Lys Val Glu Ala Gln Ala Asn Asp Glu Lys Lys Lys Val Ile Lys
            20                  25                  30

Thr Trp Ser Arg Arg Ser Thr Ile Phe Pro Ser Phe Ile Gly Tyr Thr
        35                  40                  45

Ile Ala Val Tyr Asp Gly Arg Lys His Val Pro Val Tyr Ile Gln Glu
    50                  55                  60

Asp Met Val Gly His Lys Leu Gly Glu Phe Ala Pro Thr Arg Thr Tyr
65                  70                  75                  80

Lys Gly His Ala Ala Asp Asp Lys Lys Thr Arg Arg Lys
                85                  90
```

<210> 601
<211> 114
<212> PRT
<213> Streptococcus pneumoniae

<400> 601

```
Met Ala Glu Ile Thr Ser Ala Lys Ala Met Ala Arg Thr Val Arg Val
1               5                   10                  15
```

```
Ser Pro Arg Lys Ser Arg Leu Val Leu Asp Asn Ile Arg Gly Lys Ser
            20                  25                  30

Val Ala Asp Ala Ile Ala Ile Leu Thr Phe Thr Pro Asn Lys Ala Ala
        35                  40                  45

Glu Ile Ile Leu Lys Val Leu Asn Ser Ala Val Ala Asn Ala Glu Asn
    50                  55                  60

Asn Phe Gly Leu Asp Lys Ala Asn Leu Val Val Ser Glu Ala Phe Ala
65                  70                  75                  80

Asn Glu Gly Pro Thr Met Lys Arg Phe Arg Pro Arg Ala Lys Gly Ser
                85                  90                  95

Ala Ser Pro Ile Asn Lys Arg Thr Ala His Ile Thr Val Ala Val Ala
            100                 105                 110

Glu Lys
```

<210> 602
<211> 217
<212> PRT
<213> Streptococcus pneumoniae

<400> 602

```
Met Gly Gln Lys Val His Pro Ile Gly Met Arg Val Gly Ile Ile Arg
1               5                   10                  15

Asp Trp Asp Ala Lys Trp Tyr Ala Glu Lys Glu Tyr Ala Asp Tyr Leu
            20                  25                  30

His Glu Asp Leu Ala Ile Arg Lys Phe Val Gln Lys Glu Leu Ala Asp
        35                  40                  45

Ala Ala Val Ser Thr Ile Glu Ile Glu Arg Ala Val Asn Lys Val Asn
    50                  55                  60

Val Ser Leu His Thr Ala Lys Pro Gly Met Val Ile Gly Lys Gly Gly
65                  70                  75                  80
```

```
Ala Asn Val Asp Ala Leu Arg Ala Lys Leu Asn Lys Leu Thr Gly Lys
                85                  90                  95

Gln Val His Ile Asn Ile Ile Glu Ile Lys Gln Pro Asp Leu Asp Ala
           100                 105                 110

His Leu Val Gly Glu Gly Ile Ala Arg Gln Leu Glu Gln Arg Val Ala
       115                 120                 125

Phe Arg Arg Ala Gln Lys Gln Ala Ile Gln Arg Ala Met Arg Ala Gly
   130                 135                 140

Ala Lys Gly Ile Lys Thr Gln Val Ser Gly Arg Leu Asn Gly Ala Asp
145                 150                 155                 160

Ile Ala Arg Ala Glu Gly Tyr Ser Glu Gly Thr Val Pro Leu His Thr
                165                 170                 175

Leu Arg Ala Asp Ile Asp Tyr Ala Trp Glu Glu Ala Asp Thr Thr Tyr
            180                 185                 190

Gly Lys Leu Gly Val Lys Val Trp Ile Tyr Arg Gly Glu Val Leu Pro
        195                 200                 205

Ala Arg Lys Asn Thr Lys Gly Gly Lys
    210                 215


<210>  603
<211>  122
<212>  PRT
<213>  Streptococcus pneumoniae

<400>  603

Met Ile Gln Thr Glu Thr Arg Leu Lys Val Ala Asp Asn Ser Gly Ala
1               5                   10                  15

Arg Glu Ile Leu Thr Ile Lys Val Leu Gly Gly Ser Gly Arg Lys Phe
            20                  25                  30

Ala Asn Ile Gly Asp Val Ile Val Ala Ser Val Lys Gln Ala Thr Pro
        35                  40                  45
```

```
Gly Gly Ala Val Lys Lys Gly Asp Val Val Lys Ala Val Ile Val Arg
    50                  55                  60

Thr Lys Ser Gly Ala Arg Arg Ala Asp Gly Ser Tyr Ile Lys Phe Asp
65                  70                  75                  80

Glu Asn Ala Ala Val Ile Ile Arg Glu Asp Lys Thr Pro Arg Gly Thr
                85                  90                  95

Arg Ile Phe Gly Pro Val Ala Arg Glu Leu Arg Glu Gly Gly Phe Met
            100                 105                 110

Lys Ile Val Ser Leu Ala Pro Glu Val Leu
        115                 120
```

<210> 604
<211> 101
<212> PRT
<213> Streptococcus pneumoniae

<400> 604

```
Met Phe Val Lys Lys Gly Asp Lys Val Arg Val Ile Ala Gly Lys Asp
1               5                   10                  15

Lys Gly Thr Glu Ala Val Val Leu Thr Ala Leu Pro Lys Val Asn Lys
            20                  25                  30

Val Ile Val Glu Gly Val Asn Ile Val Lys Lys His Gln Arg Pro Thr
        35                  40                  45

Asn Glu Leu Pro Gln Gly Gly Ile Ile Glu Lys Glu Ala Ala Ile His
    50                  55                  60

Val Ser Asn Val Gln Val Leu Asp Lys Asn Gly Val Ala Gly Arg Val
65                  70                  75                  80

Gly Tyr Lys Phe Val Asp Gly Lys Lys Val Arg Tyr Asn Lys Lys Ser
                85                  90                  95

Gly Glu Val Leu Asp
            100
```

<210> 605
<211> 180
<212> PRT
<213> Streptococcus pneumoniae

<400> 605

Met Ala Asn Arg Leu Lys Glu Lys Tyr Leu Asn Glu Val Val Pro Ala
1 5 10 15

Leu Thr Glu Gln Phe Asn Tyr Ser Ser Val Met Ala Val Pro Lys Val
20 25 30

Asp Lys Ile Val Leu Asn Met Gly Val Gly Glu Ala Val Ser Asn Ala
35 40 45

Lys Ser Leu Glu Lys Ala Ala Glu Glu Leu Ala Leu Ile Ser Gly Gln
50 55 60

Lys Pro Leu Ile Thr Lys Ala Lys Lys Ser Ile Ala Gly Phe Arg Leu
65 70 75 80

Arg Glu Gly Val Ala Ile Gly Ala Lys Val Thr Leu Arg Gly Glu Arg
85 90 95

Met Tyr Glu Phe Leu Asp Lys Leu Val Ser Val Ser Leu Pro Arg Val
100 105 110

Arg Asp Phe His Gly Val Pro Thr Lys Ser Phe Asp Gly Arg Gly Asn
115 120 125

Tyr Thr Leu Gly Val Lys Glu Gln Leu Ile Phe Pro Glu Ile Asn Phe
130 135 140

Asp Asp Val Asp Lys Thr Arg Gly Leu Asp Ile Val Ile Val Thr Thr
145 150 155 160

Ala Asn Thr Asp Glu Glu Ser Arg Ala Leu Leu Thr Gly Leu Gly Met
165 170 175

Pro Phe Ala Lys
180

<210> 606
<211> 132
<212> PRT
<213> Streptococcus pneumoniae

<400> 606

Met Val Met Thr Asp Pro Ile Ala Asp Phe Leu Thr Arg Ile Arg Asn
1 5 10 15

Ala Asn Gln Ala Lys His Glu Val Leu Glu Val Pro Ala Ser Asn Ile
20 25 30

Lys Lys Gly Ile Ala Glu Ile Leu Lys Arg Glu Gly Phe Val Lys Asn
35 40 45

Val Glu Ile Ile Glu Asp Asp Lys Gln Gly Val Ile Arg Val Phe Leu
50 55 60

Lys Tyr Gly Pro Asn Gly Glu Lys Val Ile Thr Asn Leu Lys Arg Val
65 70 75 80

Ser Lys Pro Gly Leu Arg Val Tyr Lys Lys Arg Glu Asp Leu Pro Lys
85 90 95

Val Leu Asn Gly Leu Gly Ile Ala Ile Leu Ser Thr Ser Glu Gly Leu
100 105 110

Leu Thr Asp Lys Glu Ala Arg Gln Lys Asn Val Gly Gly Glu Val Ile
115 120 125

Ala Tyr Val Trp
130

<210> 607
<211> 178
<212> PRT
<213> Streptococcus pneumoniae

<400> 607

Met Ser Arg Ile Gly Asn Lys Val Ile Val Leu Pro Ala Gly Val Glu
1 5 10 15

```
Leu Ala Asn Asn Asp Asn Val Val Thr Val Lys Gly Ser Lys Gly Glu
            20                  25                  30

Leu Thr Arg Glu Phe Ser Lys Asp Ile Glu Ile Arg Val Glu Gly Thr
        35                  40                  45

Glu Ile Thr Leu His Arg Pro Asn Asp Ser Lys Glu Met Lys Thr Ile
    50                  55                  60

His Gly Thr Thr Arg Ala Leu Leu Asn Asn Met Val Val Gly Val Ser
65                  70                  75                  80

Glu Gly Phe Lys Lys Glu Leu Glu Met Arg Gly Val Gly Tyr Arg Ala
                85                  90                  95

Gln Leu Gln Gly Ser Lys Leu Val Leu Ala Val Gly Lys Ser His Pro
            100                 105                 110

Asp Glu Val Glu Ala Pro Glu Gly Ile Thr Phe Glu Leu Pro Asn Pro
        115                 120                 125

Thr Thr Ile Val Val Ser Gly Ile Ser Lys Glu Val Val Gly Gln Thr
    130                 135                 140

Ala Ala Tyr Val Arg Ser Leu Arg Ser Pro Glu Pro Tyr Lys Gly Lys
145                 150                 155                 160

Gly Ile Arg Tyr Val Gly Glu Phe Val Arg Arg Lys Glu Gly Lys Thr
                165                 170                 175

Gly Lys
```

<210> 608
<211> 118
<212> PRT
<213> Streptococcus pneumoniae

<400> 608

```
Met Ile Ser Lys Pro Asp Lys Asn Lys Leu Arg Gln Lys Arg His Arg
1               5                   10                  15
```

```
Arg Val Arg Gly Lys Leu Ser Gly Thr Ala Asp Arg Pro Arg Leu Asn
            20                  25                  30

Val Phe Arg Ser Asn Thr Gly Ile Tyr Ala Gln Val Ile Asp Asp Val
        35                  40                  45

Ala Gly Val Thr Leu Ala Ser Ala Ser Thr Leu Asp Lys Glu Val Ser
    50                  55                  60

Lys Gly Thr Lys Thr Glu Gln Ala Val Ala Val Gly Lys Leu Val Ala
65                  70                  75                  80

Glu Arg Ala Asn Ala Lys Gly Ile Ser Glu Val Val Phe Asp Arg Gly
                85                  90                  95

Gly Tyr Leu Tyr His Gly Arg Val Lys Ala Leu Ala Asp Ala Ala Arg
            100                 105                 110

Glu Asn Gly Leu Lys Phe
        115

<210>  609
<211>  164
<212>  PRT
<213>  Streptococcus pneumoniae

<400>  609

Met Ala Phe Lys Asp Asn Ala Val Glu Leu Glu Glu Arg Val Val Ala
1               5                   10                  15

Val Asn Arg Val Thr Lys Val Val Lys Gly Gly Arg Arg Leu Arg Phe
            20                  25                  30

Ala Ala Leu Val Val Val Gly Asp His Asn Gly Arg Val Gly Phe Gly
        35                  40                  45

Thr Gly Lys Ala Gln Glu Val Pro Glu Ala Ile Arg Lys Ala Val Asp
    50                  55                  60

Asp Ala Lys Lys Asn Leu Ile Glu Val Pro Met Val Gly Thr Thr Ile
65                  70                  75                  80
```

Pro His Glu Val Leu Ser Glu Phe Gly Gly Ala Lys Val Leu Leu Lys
85 90 95

Pro Ala Val Glu Gly Ser Gly Val Ala Ala Gly Gly Ala Val Arg Ala
100 105 110

Val Val Glu Leu Ala Gly Val Ala Asp Ile Thr Ser Lys Ser Leu Gly
115 120 125

Ser Asn Thr Pro Ile Asn Ile Val Arg Ala Thr Val Glu Gly Leu Lys
130 135 140

Gln Leu Lys Arg Ala Glu Glu Ile Ala Ala Leu Arg Gly Ile Ser Val
145 150 155 160

Ser Asp Leu Ala

<210> 610
<211> 146
<212> PRT
<213> Streptococcus pneumoniae

<400> 610

Met Lys Leu His Glu Leu Lys Pro Ala Glu Gly Ser Arg Lys Val Arg
1 5 10 15

Asn Arg Val Gly Arg Gly Thr Ser Ser Gly Asn Gly Lys Thr Ser Gly
20 25 30

Arg Gly Gln Lys Gly Gln Lys Ala Arg Ser Gly Gly Gly Val Arg Leu
35 40 45

Gly Phe Glu Gly Gly Gln Thr Pro Leu Phe Arg Arg Leu Pro Lys Arg
50 55 60

Gly Phe Thr Asn Ile Asn Ala Lys Glu Tyr Ala Ile Val Asn Leu Asp
65 70 75 80

Gln Leu Asn Val Phe Glu Asp Gly Ala Glu Val Thr Pro Val Val Leu
85 90 95

```
Ile Glu Ala Gly Ile Val Lys Ala Glu Lys Ser Gly Ile Lys Ile Leu
            100                 105                 110

Gly Asn Gly Glu Leu Thr Lys Lys Leu Thr Val Lys Ala Ala Lys Phe
        115                 120                 125

Ser Lys Ser Ala Glu Glu Ala Ile Thr Ala Lys Gly Gly Ser Val Glu
    130                 135                 140

Val Ile
145
```

<210> 611
<211> 436
<212> PRT
<213> Streptococcus pneumoniae

<400> 611

```
Met Phe Phe Lys Leu Leu Arg Glu Ala Leu Lys Val Lys Gln Val Arg
1               5                   10                  15

Ser Lys Ile Leu Phe Thr Ile Phe Ile Val Leu Val Phe Arg Ile Gly
            20                  25                  30

Thr Ser Ile Thr Val Pro Gly Val Asn Ala Asn Ser Leu Asn Ala Leu
        35                  40                  45

Ser Gly Leu Ser Phe Leu Asn Met Leu Ser Leu Val Ser Gly Asn Ala
    50                  55                  60

Leu Lys Asn Phe Ser Ile Phe Ala Leu Gly Val Ser Pro Tyr Ile Thr
65                  70                  75                  80

Ala Ser Ile Val Val Gln Leu Leu Gln Met Asp Ile Leu Pro Lys Phe
                85                  90                  95

Val Glu Trp Gly Lys Gln Gly Glu Val Gly Arg Arg Lys Leu Asn Gln
            100                 105                 110

Ala Thr Arg Tyr Ile Ala Leu Val Leu Ala Phe Val Gln Ser Ile Gly
        115                 120                 125
```

```
Ile Thr Ala Gly Phe Asn Thr Leu Ala Gly Ala Gln Leu Ile Lys Thr
    130                 135                 140

Ala Leu Thr Pro Gln Val Phe Leu Thr Ile Gly Ile Ile Leu Thr Ala
145                 150                 155                 160

Gly Ser Met Ile Val Thr Trp Leu Gly Glu Gln Ile Thr Asp Lys Gly
                165                 170                 175

Tyr Gly Asn Gly Val Ser Met Ile Ile Phe Ala Gly Ile Val Ser Ser
            180                 185                 190

Ile Pro Glu Met Ile Gln Gly Ile Tyr Val Asp Tyr Phe Val Asn Val
        195                 200                 205

Pro Ser Ser Arg Ile Thr Ser Ser Ile Ile Phe Val Ile Ile Leu Ile
    210                 215                 220

Ile Thr Val Leu Leu Ile Ile Tyr Phe Thr Thr Tyr Val Gln Gln Ala
225                 230                 235                 240

Glu Tyr Lys Ile Pro Ile Gln Tyr Thr Lys Val Ala Gln Gly Ala Pro
                245                 250                 255

Ser Ser Ser Tyr Leu Pro Leu Lys Val Asn Pro Ala Gly Val Ile Pro
            260                 265                 270

Val Ile Phe Ala Ser Ser Ile Thr Ala Ala Pro Ala Ala Ile Leu Gln
        275                 280                 285

Phe Leu Ser Ala Thr Gly His Asp Trp Ala Trp Val Arg Val Ala Gln
    290                 295                 300

Glu Met Leu Ala Thr Thr Ser Pro Thr Gly Ile Ala Met Tyr Ala Leu
305                 310                 315                 320

Leu Ile Ile Leu Phe Thr Phe Phe Tyr Thr Phe Val Gln Ile Asn Pro
                325                 330                 335

Glu Lys Ala Ala Glu Ser Leu Gln Lys Ser Gly Ala Tyr Ile His Gly
            340                 345                 350
```

```
Val Arg Pro Gly Lys Gly Thr Glu Glu Tyr Met Ser Lys Leu Leu Arg
        355                 360                 365

Arg Leu Ala Thr Val Gly Ser Leu Phe Leu Gly Val Ile Ser Ile Leu
    370                 375                 380

Pro Ile Ala Ala Lys Asp Val Phe Gly Leu Ser Asp Val Val Ala Phe
385                 390                 395                 400

Gly Gly Thr Ser Leu Leu Ile Ile Ile Ser Thr Gly Ile Glu Gly Ile
                405                 410                 415

Lys Gln Leu Glu Gly Tyr Leu Leu Lys Arg Lys Tyr Val Gly Phe Met
            420                 425                 430

Asp Arg Thr Glu
        435


<210>  612
<211>  212
<212>  PRT
<213>  Streptococcus pneumoniae

<400>  612

Met Asn Leu Leu Ile Met Gly Leu Pro Gly Ala Gly Lys Gly Thr Gln
1               5                   10                  15

Ala Ala Lys Ile Val Glu Gln Phe His Val Ala His Ile Ser Thr Gly
            20                  25                  30

Asp Met Phe Arg Ala Ala Met Ala Asn Gln Thr Glu Met Gly Val Leu
        35                  40                  45

Ala Lys Ser Tyr Ile Asp Lys Gly Glu Leu Val Pro Asp Glu Val Thr
    50                  55                  60

Asn Gly Ile Val Lys Glu Arg Leu Ser Gln Asp Asp Ile Lys Glu Thr
65                  70                  75                  80

Gly Phe Leu Leu Asp Gly Tyr Pro Arg Thr Ile Glu Gln Ala His Ala
                85                  90                  95
```

```
Leu Asp Lys Thr Leu Ala Glu Leu Gly Ile Glu Leu Glu Gly Val Ile
            100                 105                 110

Asn Ile Glu Val Asn Pro Asp Ser Leu Leu Glu Arg Leu Ser Gly Arg
        115                 120                 125

Ile Ile His Arg Val Thr Gly Glu Thr Phe His Lys Val Phe Asn Pro
    130                 135                 140

Pro Val Asp Tyr Lys Glu Glu Asp Tyr Tyr Gln Arg Glu Asp Asp Lys
145                 150                 155                 160

Pro Glu Thr Val Lys Arg Arg Leu Asp Val Asn Ile Ala Gln Gly Glu
                165                 170                 175

Pro Ile Ile Ala His Tyr Arg Ala Lys Gly Leu Val His Asp Ile Glu
            180                 185                 190

Gly Asn Gln Asp Ile Asn Asp Val Phe Ser Asp Ile Glu Lys Val Leu
        195                 200                 205

Thr Asn Leu Lys
    210
```

<210> 613
<211> 121
<212> PRT
<213> Streptococcus pneumoniae

<400> 613

```
Met Ala Arg Ile Ala Gly Val Asp Ile Pro Asn Asp Lys Arg Val Val
1               5                   10                  15

Ile Ser Leu Thr Tyr Val Tyr Gly Ile Gly Leu Ala Thr Ser Lys Lys
            20                  25                  30

Ile Leu Ala Ala Ala Gly Ile Ser Glu Asp Val Arg Val Arg Asp Leu
        35                  40                  45

Thr Ser Asp Gln Glu Asp Ala Ile Arg Arg Glu Val Asp Ala Ile Lys
    50                  55                  60
```

```
Val Glu Gly Asp Leu Arg Arg Glu Val Asn Leu Asn Ile Lys Arg Leu
65                  70                  75                  80

Met Glu Ile Gly Ser Tyr Arg Gly Ile Arg His Arg Arg Gly Leu Pro
                85                  90                  95

Val Arg Gly Gln Asn Thr Lys Asn Asn Ala Arg Thr Arg Lys Gly Lys
            100                 105                 110

Ala Val Ala Ile Ala Gly Lys Lys Lys
        115                 120
```

<210> 614
<211> 127
<212> PRT
<213> Streptococcus pneumoniae

<400> 614

```
Met Ala Lys Pro Thr Arg Lys Arg Arg Val Lys Lys Asn Ile Glu Ser
1               5                   10                  15

Gly Ile Ala His Ile His Ala Thr Phe Asn Asn Thr Ile Val Met Ile
            20                  25                  30

Thr Asp Val His Gly Asn Ala Ile Ala Trp Ser Ser Ala Gly Ala Leu
        35                  40                  45

Gly Phe Lys Gly Ser Arg Lys Ser Thr Pro Phe Ala Ala Gln Met Ala
    50                  55                  60

Ser Glu Ala Ala Ala Lys Ser Ala Gln Glu His Gly Leu Lys Ser Val
65                  70                  75                  80

Glu Val Thr Val Lys Gly Pro Gly Ser Gly Arg Glu Ser Ala Ile Arg
                85                  90                  95

Ala Leu Ala Ala Ala Gly Leu Glu Val Thr Ala Ile Arg Asp Val Thr
            100                 105                 110

Pro Val Pro His Asn Gly Ala Arg Pro Pro Lys Arg Arg Arg Val
        115                 120                 125
```

<210> 615
<211> 128
<212> PRT
<213> Streptococcus pneumoniae

<400> 615

Met Ala Tyr Arg Lys Leu Gly Arg Thr Ser Ser Gln Arg Lys Ala Met
1 5 10 15

Leu Arg Asp Leu Thr Thr Asp Leu Leu Ile Asn Glu Ser Ile Val Thr
20 25 30

Thr Glu Ala Arg Ala Lys Glu Ile Arg Lys Thr Val Glu Lys Met Ile
35 40 45

Thr Leu Gly Lys Arg Gly Asp Leu His Ala Arg Arg Gln Ala Ala Ala
50 55 60

Phe Val Arg Asn Glu Ile Ala Ser Glu Asn Tyr Asp Glu Ala Thr Asp
65 70 75 80

Lys Tyr Thr Ser Thr Thr Ala Leu Gln Lys Leu Phe Ser Glu Ile Ala
85 90 95

Pro Arg Tyr Ala Glu Arg Asn Gly Gly Tyr Thr Arg Ile Leu Lys Thr
100 105 110

Glu Ser Arg Arg Gly Asp Ala Ala Pro Met Ala Ile Ile Glu Leu Val
115 120 125

<210> 616
<211> 137
<212> PRT
<213> Streptococcus pneumoniae

<400> 616

Met Pro Thr Ile Asn Gln Leu Val Arg Lys Pro Arg Lys Ser Lys Val
1 5 10 15

Glu Lys Ser Lys Ser Pro Ala Leu Asn Val Gly Tyr Asn Ser His Lys
20 25 30

```
Lys Val Gln Thr Asn Val Ser Ser Pro Gln Lys Arg Gly Val Ala Thr
        35                  40                  45

Arg Val Gly Thr Met Thr Pro Lys Lys Pro Asn Ser Ala Leu Arg Lys
    50                  55                  60

Phe Ala Arg Val Arg Leu Ser Asn Leu Ile Glu Val Thr Ala Tyr Ile
65                  70                  75                  80

Pro Gly Ile Gly His Asn Leu Gln Glu His Ser Val Val Leu Leu Arg
                85                  90                  95

Gly Gly Arg Val Lys Asp Leu Pro Gly Val Arg Tyr His Ile Val Arg
            100                 105                 110

Gly Ala Leu Asp Thr Ala Gly Val Asn Asp Arg Lys Gln Gly Arg Ser
        115                 120                 125

Lys Tyr Gly Thr Lys Arg Pro Lys Ala
    130                 135

<210>  617
<211>  156
<212>  PRT
<213>  Streptococcus pneumoniae

<400>  617

Met Ser Arg Lys Asn Arg Ala Pro Lys Arg Asp Val Leu Pro Asp Pro
1               5                   10                  15

Leu Tyr Asn Ser Gln Leu Val Thr Arg Leu Ile Asn Arg Val Met Leu
            20                  25                  30

Asp Gly Lys Arg Gly Thr Ala Ala Ser Ile Val Tyr Gly Ala Phe Glu
        35                  40                  45

Gln Ile Lys Glu Ala Thr Gly Asn Asp Ala Leu Glu Val Phe Glu Thr
    50                  55                  60

Ala Met Glu Asn Ile Met Pro Val Leu Glu Val Arg Ala Arg Arg Val
65                  70                  75                  80
```

```
Gly Gly Ser Asn Tyr Gln Val Pro Val Lys Val Arg Pro Glu Arg Arg
                85                  90                  95

Thr Thr Leu Gly Leu Arg Trp Leu Val Thr Ile Ala Arg Leu Arg Gly
            100                 105                 110

Glu His Thr Met Gln Asp Arg Leu Ala Lys Glu Ile Leu Asp Ala Ala
        115                 120                 125

Asn Asn Thr Gly Ala Ala Val Lys Lys Arg Glu Asp Thr His Arg Met
    130                 135                 140

Ala Glu Ala Asn Arg Ala Phe Ala His Phe Arg Trp
145                 150                 155
```

<210> 618
<211> 303
<212> PRT
<213> Streptococcus pneumoniae

<400> 618

```
Met Thr Glu Lys Leu Gln Leu Thr Lys Ser Asp Arg Lys Lys Val Trp
1               5                   10                  15

Trp Arg Ser Thr Phe Leu Gln Gly Ser Trp Asn Phe Glu Arg Met Gln
            20                  25                  30

Asn Leu Gly Trp Ala Tyr Thr Leu Ile Pro Ala Ile Lys Lys Leu Tyr
        35                  40                  45

Thr Lys Lys Glu Asp Gln Ile Ala Ala Leu Glu Arg His Leu Glu Phe
    50                  55                  60

Phe Asn Thr His Pro Tyr Val Ala Ala Pro Val Met Gly Val Thr Leu
65                  70                  75                  80

Ala Leu Glu Glu Glu Arg Ala Asn Gly Val Glu Ile Asp Asp Ala Ala
                85                  90                  95

Ile Gln Gly Val Lys Ile Gly Met Met Gly Pro Leu Ala Gly Ile Gly
            100                 105                 110
```

```
Asp Pro Val Phe Trp Phe Thr Val Arg Pro Ile Leu Gly Ser Leu Gly
        115                 120                 125

Ala Ser Leu Ala Leu Thr Gly Asn Ile Leu Gly Pro Leu Leu Phe Phe
    130                 135                 140

Val Ala Trp Asn Leu Ile Arg Met Ser Phe Leu Trp Tyr Val Gln Glu
145                 150                 155                 160

Ile Gly Tyr Lys Ala Gly Ser Glu Ile Thr Lys Asp Met Ser Gly Gly
                165                 170                 175

Ile Leu Gln Asp Ile Thr Lys Gly Ala Ser Ile Leu Gly Met Phe Ile
            180                 185                 190

Leu Ala Val Leu Val Gln Arg Trp Val Asn Ile Lys Phe Ala Phe Asp
        195                 200                 205

Val Ser Lys Val Gln Leu Asp Glu Lys Ala Tyr Ile His Trp Asp Lys
    210                 215                 220

Leu Pro Glu Gly Ser Lys Gly Ile Gln Glu Ala Phe Ala Gln Val Gly
225                 230                 235                 240

Gln Gly Leu Ser Gln Thr Pro Glu Lys Val Thr Thr Phe Gln Gln Asn
                245                 250                 255

Leu Asp Met Leu Ile Pro Gly Leu Ser Gly Leu Leu Leu Thr Leu Leu
            260                 265                 270

Cys Met Tyr Leu Leu Lys Lys Lys Val Ser Pro Ile Thr Ile Ile Leu
        275                 280                 285

Ala Leu Phe Ala Val Gly Ile Val Ala His Val Leu His Ile Met
    290                 295                 300
```

<210> 619
<211> 267
<212> PRT
<213> Streptococcus pneumoniae

<400> 619

```
Met Ser Ile Ile Ser Met Val Leu Val Val Val Val Ala Phe Phe Ala
1               5                  10                  15

Gly Leu Glu Gly Ile Leu Asp Gln Phe Gln Phe His Gln Pro Leu Val
            20                  25                  30

Ala Cys Thr Leu Ile Gly Leu Val Thr Gly His Leu Glu Ala Gly Ile
        35                  40                  45

Ile Leu Gly Gly Ser Leu Gln Met Ile Ala Leu Gly Trp Ser Asn Ile
    50                  55                  60

Gly Ala Ala Ile Ala Pro Asp Ala Ala Leu Ala Ser Val Ala Ala Ala
65                  70                  75                  80

Ile Ile Met Val Leu Gly Gly Asp Phe Thr Lys Thr Gly Ile Gly Val
                85                  90                  95

Ala Gln Ala Val Ala Ile Pro Leu Ala Val Ala Gly Leu Phe Leu Thr
            100                 105                 110

Met Ile Val Arg Thr Ile Ser Val Gly Leu Val His Thr Ala Asp Ala
        115                 120                 125

Ala Ala Lys Lys Gly Asp Phe Gly Ala Val Glu Arg Ala His Phe Ile
    130                 135                 140

Ala Leu Leu Phe Gln Gly Leu Arg Ile Ala Leu Pro Ala Ala Leu Leu
145                 150                 155                 160

Leu Met Val Pro Thr Glu Thr Val Gln Ser Ile Leu Ser Ala Met Pro
                165                 170                 175

Asp Trp Leu Lys Asp Gly Met Ala Ile Gly Gly Gly Met Val Val Ala
            180                 185                 190

Val Gly Tyr Ala Met Val Ile Asn Met Met Ala Thr Arg Glu Val Trp
        195                 200                 205

Pro Phe Phe Ala Leu Gly Phe Val Leu Ala Ala Val Ser Asp Ile Thr
    210                 215                 220
```

```
Leu Ile Gly Phe Gly Ala Ile Gly Val Ala Ile Ala Leu Ile Tyr Leu
225                 230                 235                 240

His Leu Ser Lys Thr Gly Gly Asn Gly Gly Gly Gly Ala Ala Thr Ser
                245                 250                 255

Asn Asp Pro Ile Gly Asp Ile Leu Glu Asp Tyr
            260                 265
```

<210> 620
<211> 332
<212> PRT
<213> Streptococcus pneumoniae

<400> 620

```
Met Thr Ile Met Ser Ile Gly Ile Ile Ile Ala Ser His Gly Glu Phe
1               5                   10                  15

Ala Ala Gly Ile His Gln Ser Gly Ser Met Ile Phe Gly Glu Gln Glu
            20                  25                  30

Lys Val Gln Val Val Thr Phe Met Pro Asn Glu Gly Pro Asp Asp Leu
        35                  40                  45

Tyr Ala Lys Phe Asn Asn Ala Val Ala Ala Phe Asp Ala Glu Asp Glu
    50                  55                  60

Val Leu Val Leu Ala Asp Leu Trp Ser Gly Ser Pro Phe Asn Gln Ala
65                  70                  75                  80

Ser Arg Val Met Gly Glu Asn Pro Glu Arg Lys Phe Ala Ile Ile Thr
                85                  90                  95

Gly Leu Asn Leu Pro Met Leu Ile Gln Ala Tyr Thr Glu Arg Leu Met
            100                 105                 110

Asp Ala Ala Ala Gly Val Glu Lys Val Ala Ala Asn Ile Ile Lys Glu
        115                 120                 125

Ala Lys Asp Gly Ile Lys Ala Leu Pro Glu Glu Leu Asn Pro Val Glu
    130                 135                 140
```

```
Glu Val Ala Ser Ala Ala Ala Ala Pro Val Ala Gln Thr Ala Ile Pro
145                 150                 155                 160

Glu Gly Thr Val Ile Gly Asp Gly Lys Leu Lys Ile Asn Leu Ala Arg
                165                 170                 175

Leu Asp Thr Arg Leu Leu His Gly Gln Val Ala Thr Ala Trp Thr Pro
            180                 185                 190

Asp Ser Lys Ala Asn Arg Ile Ile Val Ala Ser Asp Asn Val Ala Lys
        195                 200                 205

Asp Asp Leu Arg Lys Glu Leu Ile Lys Gln Ala Ala Pro Gly Asn Val
    210                 215                 220

Lys Ala Asn Val Val Pro Ile Gln Lys Leu Ile Glu Ile Ser Lys Asp
225                 230                 235                 240

Pro Arg Phe Gly Glu Thr His Ala Leu Ile Leu Phe Glu Thr Pro Gln
                245                 250                 255

Asp Ala Leu Arg Ala Ile Glu Gly Gly Val Pro Ile Lys Thr Leu Asn
            260                 265                 270

Val Gly Ser Met Ala His Ser Thr Gly Lys Thr Leu Val Asn Thr Val
        275                 280                 285

Leu Ser Met Asp Lys Glu Asp Val Ala Thr Phe Glu Lys Met Arg Asp
    290                 295                 300

Leu Gly Val Glu Phe Asp Val Arg Lys Val Pro Asn Asp Ser Lys Lys
305                 310                 315                 320

Asp Leu Phe Asp Leu Ile Asn Lys Ala Asn Val Lys
                325                 330
```

<210> 621
<211> 339
<212> PRT
<213> Streptococcus pneumoniae

<400> 621

```
Met Lys Ala Val Val Val Asn Pro Glu Ser Thr Gly Val Ala Ile Glu
1               5                  10                  15

Glu Lys Val Leu Arg Pro Leu Glu Thr Gly Glu Ala Leu Val Glu Val
            20                  25                  30

Glu Tyr Cys Gly Val Cys His Thr Asp Leu His Val Ala His Gly Asp
        35                  40                  45

Phe Gly Gln Val Pro Gly Arg Val Leu Gly His Glu Gly Ile Gly Ile
    50                  55                  60

Val Lys Glu Ile Ala Pro Asp Val Lys Ser Leu Lys Val Gly Asp Arg
65                  70                  75                  80

Val Ser Val Ala Trp Phe Phe Glu Gly Cys Gly Thr Cys Glu Tyr Cys
                85                  90                  95

Thr Thr Gly Arg Glu Thr Leu Cys Arg Thr Val Lys Asn Ala Gly Tyr
            100                 105                 110

Ser Val Asp Gly Gly Met Ala Glu Gln Cys Ile Val Thr Ala Asp Tyr
        115                 120                 125

Ala Val Lys Val Pro Asp Gly Leu Asp Pro Ala Gln Ala Ser Ser Ile
    130                 135                 140

Thr Cys Ala Gly Val Thr Thr Tyr Lys Ala Ile Lys Glu Ala Lys Val
145                 150                 155                 160

Glu Pro Gly Gln Trp Val Val Leu Tyr Gly Ala Gly Gly Leu Gly Asn
                165                 170                 175

Leu Ala Val Gln Tyr Ala Lys Lys Val Phe Asn Ala His Val Ile Ala
            180                 185                 190

Val Asp Ile Asn Asn Asp Lys Leu Ala Leu Ala Lys Glu Val Gly Ala
        195                 200                 205

Asp Ile Val Ile Asn Gly Leu Glu Val Glu Asp Val Ala Gly Leu Ile
    210                 215                 220
```

```
Lys Glu Lys Thr Asp Gly Gly Ala His Ser Ala Val Val Thr Ala Val
225                 230                 235                 240

Ser Lys Val Ala Phe Asn Gln Ala Val Asp Ser Ile Arg Ala Gly Gly
                245                 250                 255

Arg Val Val Ala Val Gly Leu Pro Ser Glu Met Met Glu Leu Ser Ile
            260                 265                 270

Val Lys Thr Val Leu Asp Gly Ile Gln Val Ile Gly Ser Leu Val Gly
        275                 280                 285

Thr Arg Lys Asp Leu Glu Glu Ala Phe Gln Phe Gly Ala Glu Gly Leu
    290                 295                 300

Val Val Pro Val Val Gln Lys Arg Pro Val Glu Asp Ala Val Ala Ile
305                 310                 315                 320

Phe Asp Glu Met Glu Lys Gly Gln Ile Gln Gly Arg Met Val Leu Asp
                325                 330                 335

Phe Thr His
```

<210> 622
<211> 148
<212> PRT
<213> Streptococcus pneumoniae

<400> 622

```
Met Asn Lys Thr Thr Phe Met Ala Lys Pro Gly Gln Val Glu Arg Lys
1               5                   10                  15

Trp Tyr Val Val Asp Ala Thr Asp Val Pro Leu Gly Arg Leu Ser Ala
            20                  25                  30

Val Val Ala Ser Val Leu Arg Gly Lys Asn Lys Pro Thr Phe Thr Pro
        35                  40                  45

His Thr Asp Thr Gly Asp Phe Val Ile Val Ile Asn Ala Glu Lys Val
    50                  55                  60
```

```
Lys Leu Thr Gly Lys Lys Ala Thr Asp Lys Ile Tyr Tyr Thr His Ser
65                  70                  75                  80

Asn His Pro Gly Gly Leu Lys Gln Ile Ser Ala Gly Glu Leu Arg Ser
                85                  90                  95

Lys Asn Ala Val Arg Leu Ile Glu Lys Ser Val Lys Gly Met Leu Pro
            100                 105                 110

His Asn Thr Leu Gly Arg Ala Gln Gly Met Lys Leu Lys Val Phe Val
        115                 120                 125

Gly Ala Glu His Thr His Ala Ala Gln Gln Pro Glu Val Leu Asp Ile
    130                 135                 140

Ser Gly Leu Ile
145
```

<210> 623
<211> 130
<212> PRT
<213> Streptococcus pneumoniae

<400> 623

```
Met Ser Gln Ala Gln Tyr Ala Gly Thr Gly Arg Arg Lys Asn Ala Val
1               5                   10                  15

Ala Arg Val Arg Leu Val Pro Gly Thr Gly Lys Ile Thr Val Asn Lys
            20                  25                  30

Lys Asp Val Glu Glu Tyr Ile Pro His Ala Asp Leu Arg Leu Val Ile
        35                  40                  45

Asn Gln Pro Phe Ala Val Thr Ser Thr Val Gly Ser Tyr Asp Val Phe
    50                  55                  60

Val Asn Val Ile Gly Gly Gly Tyr Ala Gly Gln Ser Gly Ala Ile Arg
65                  70                  75                  80

His Gly Ile Ala Arg Ala Leu Leu Gln Val Asp Pro Asp Phe Arg Asp
                85                  90                  95
```

```
Ser Leu Lys Arg Ala Gly Leu Leu Thr Arg Asp Ser Arg Lys Val Glu
            100                 105                 110

Arg Lys Lys Pro Gly Leu Lys Lys Ala Arg Lys Ala Ser Gln Phe Ser
        115                 120                 125

Lys Arg
    130
```

<210> 624
<211> 272
<212> PRT
<213> Streptococcus pneumoniae

<400> 624

```
Met Thr Gly Ser Asn Lys Leu Thr Lys Arg Asp Tyr Leu Lys Thr Ser
1               5                   10                  15

Leu Arg Ala Phe Phe Cys Gln Asn Gly Phe Asn Tyr Ser Asn Tyr Gln
            20                  25                  30

Gly Leu Gly Tyr Ala Asn Val Met Tyr Pro Ala Leu Lys Lys His Tyr
        35                  40                  45

Gly Glu Asp Gln Glu Gly Phe Tyr Gln Ala Leu Glu Glu Asn Cys Glu
    50                  55                  60

Phe Tyr Asn Thr Asn Pro His Phe Leu Pro Phe Ile Thr Ser Leu His
65                  70                  75                  80

Leu Val Met Leu Glu Asn Gly Arg Pro Ala Lys Glu Thr Arg Ser Ile
                85                  90                  95

Lys Met Ala Leu Met Gly Pro Leu Ala Gly Ile Gly Asp Ser Leu Ser
            100                 105                 110

Gln Phe Cys Leu Ala Pro Leu Phe Ser Thr Ile Ala Ala Ser Phe Ala
        115                 120                 125

Gln Glu Gly Leu Val Val Gly Pro Ile Leu Phe Phe Leu Ala Met Asn
    130                 135                 140
```

```
Thr Ile Leu Thr Ala Ile Lys Leu Ser Thr Gly Leu Tyr Gly Tyr Lys
145                 150                 155                 160

Leu Gly Thr Thr Val Ile Asp Lys Leu Ser Glu Gln Met Ala Thr Ile
                165                 170                 175

Ser Arg Ile Ala Asn Ile Ile Gly Val Thr Val Ile Ala Gly Leu Ala
            180                 185                 190

Ala Thr Ser Val Lys Ile Met Val Pro Ile Thr Phe Ala Ala Gly Glu
        195                 200                 205

Val Lys Ala Asp Ala Lys Gln Ser Ile Val Ser Ile Gln Gly Met Leu
    210                 215                 220

Asp Lys Val Ala Pro Ala Leu Leu Pro Ala Leu Phe Thr Leu Leu Val
225                 230                 235                 240

Tyr Tyr Leu Ile Lys Glu Lys Lys Trp Thr Thr Tyr Lys Leu Val Ile
                245                 250                 255

Leu Thr Val Ile Ile Gly Ile Ile Gly Ser Trp Leu Lys Ile Ile Ala
            260                 265                 270
```

<210> 625
<211> 494
<212> PRT
<213> Streptococcus pneumoniae

<400> 625

```
Met Lys Lys Gln Ala Phe Ser Ser Glu Gln Tyr Leu Asn Leu Gln Arg
1               5                   10                  15

Asp His Ile Leu Glu Arg Ile Asn Gln Phe Asp Gly Lys Leu Tyr Leu
            20                  25                  30

Glu Phe Gly Gly Lys Met Leu Glu Asp Phe His Ala Ala Arg Val Leu
        35                  40                  45

Pro Gly Tyr Glu Pro Asp Asn Lys Ile Lys Leu Leu Gln Glu Leu Lys
    50                  55                  60
```

```
Glu Gln Val Glu Val Val Ile Ala Ile Asn Ala Ser Asn Ile Glu His
65                  70                  75                  80

Ser Lys Ala Arg Gly Asp Leu Gly Ile Ser Tyr Asp Gln Glu Val Leu
                85                  90                  95

Arg Leu Ile Asp Lys Phe Asn Glu Leu Gly Ile Phe Val Gly Ser Val
            100                 105                 110

Val Ile Thr Gln Tyr Ala Gly Gln Pro Ala Ala Asp Ala Phe Arg Asn
        115                 120                 125

Gln Leu Glu Lys Asn Gly Ile Asp Ser Tyr Leu His Tyr Pro Ile Lys
    130                 135                 140

Gly Tyr Pro Thr Asp Met Asp His Ile Ile Ser Pro Glu Gly Met Gly
145                 150                 155                 160

Lys Asn Asp Tyr Ile Lys Thr Ser Arg Asn Leu Ile Val Val Thr Ala
                165                 170                 175

Pro Gly Pro Gly Ser Gly Lys Leu Ala Thr Cys Met Ser Asn Met Tyr
            180                 185                 190

His Asp Gln Ile Asn Gly Ile Lys Ser Gly Tyr Ala Lys Phe Glu Thr
        195                 200                 205

Phe Pro Val Trp Asn Leu Pro Leu His His Pro Val Asn Leu Ala Tyr
    210                 215                 220

Glu Ala Ala Thr Ala Asp Leu Asp Asp Val Asn Met Ile Asp Pro Phe
225                 230                 235                 240

His Leu Gln Thr Tyr Gly Glu Thr Thr Val Asn Tyr Asn Arg Asp Ile
                245                 250                 255

Glu Ile Phe Pro Val Leu Lys Arg Met Leu Glu Arg Ile Leu Gly Lys
            260                 265                 270

Ser Pro Tyr Ala Ser Pro Thr Asp Met Gly Val Asn Met Val Gly Phe
```

```
        275                 280                 285

Ala Ile Thr Asp Asp Glu Ala Ala Val Glu Ala Ser Lys Gln Glu Ile
    290                 295                 300

Ile Arg Arg Tyr Tyr Gln Thr Val Leu Asp Phe Lys Ala Glu Lys Val
305                 310                 315                 320

Gly Glu Ala Ala Val Lys Lys Ile Glu Leu Leu Met Asn Asp Leu Gly
                325                 330                 335

Ile Thr Pro Ala Asp Arg Lys Val Ala Val Val Ala Arg Gln Lys Ala
            340                 345                 350

Glu Glu Thr Gly Gly Pro Ala Leu Ala Phe Glu Leu Pro Asn Gly Glu
        355                 360                 365

Ile Ile Thr Gly Lys Asn Ser Glu Leu Phe Gly Pro Thr Ala Ala Ala
    370                 375                 380

Leu Ile Asn Ala Ile Lys Lys Ser Ala Asp Ile Ala Lys Glu Val Lys
385                 390                 395                 400

Leu Ile Glu Pro Glu Val Val Lys Pro Ile Gln Gly Leu Lys Ile Asp
                405                 410                 415

His Leu Gly Ser Arg Asn Pro Arg Leu His Ser Asn Glu Ile Leu Ile
            420                 425                 430

Ala Leu Ala Ile Thr Ala Thr Glu Asn Pro Asp Ala Ala Arg Ala Met
        435                 440                 445

Glu Glu Leu Gly Asn Leu Lys Gly Ser Glu Ala His Ser Thr Ile Ile
    450                 455                 460

Leu Thr Asp Glu Asp Lys Asn Val Leu Arg Lys Leu Gly Ile Asn Val
465                 470                 475                 480

Thr Phe Asp Pro Tyr Tyr Gln Tyr Asp Arg Leu Tyr Arg Lys
                485                 490
```

<210> 626
<211> 719
<212> PRT
<213> Streptococcus pneumoniae

<400> 626

Met Asn Lys Pro Thr Ile Leu Arg Leu Ile Lys Tyr Leu Ser Ile Ser
1 5 10 15

Phe Leu Ser Leu Val Ile Ala Ala Ile Val Leu Gly Gly Gly Val Phe
20 25 30

Phe Tyr Tyr Val Ser Lys Ala Pro Ser Leu Ser Glu Ser Lys Leu Val
35 40 45

Ala Thr Thr Ser Ser Lys Ile Tyr Asp Asn Lys Asn Gln Leu Ile Ala
50 55 60

Asp Leu Gly Ser Glu Arg Arg Val Asn Ala Gln Ala Asn Asp Ile Pro
65 70 75 80

Thr Asp Leu Val Lys Ala Ile Val Ser Ile Glu Asp His Arg Phe Phe
85 90 95

Asp His Arg Gly Ile Asp Thr Ile Arg Ile Leu Gly Ala Phe Leu Arg
100 105 110

Asn Leu Gln Ser Asn Ser Leu Gln Gly Gly Ser Thr Leu Thr Gln Gln
115 120 125

Leu Ile Lys Leu Thr Tyr Phe Ser Thr Ser Thr Ser Asp Gln Thr Ile
130 135 140

Ser Arg Lys Ala Gln Glu Ala Trp Leu Ala Ile Gln Leu Glu Gln Lys
145 150 155 160

Ala Thr Lys Gln Glu Ile Leu Thr Tyr Tyr Ile Asn Lys Val Tyr Met
165 170 175

Ser Asn Gly Asn Tyr Gly Met Gln Thr Ala Ala Gln Asn Tyr Tyr Gly
180 185 190

```
Lys Asp Leu Asn Asn Leu Ser Leu Pro Gln Leu Ala Leu Leu Ala Gly
        195                 200                 205

Met Pro Gln Ala Pro Asn Gln Tyr Asp Pro Tyr Ser His Pro Glu Ala
    210                 215                 220

Ala Gln Asp Arg Arg Asn Leu Val Leu Ser Glu Met Lys Asn Gln Gly
225                 230                 235                 240

Tyr Ile Ser Ala Glu Gln Tyr Glu Lys Ala Val Asn Thr Pro Ile Thr
                245                 250                 255

Asp Gly Leu Gln Ser Leu Lys Ser Ala Ser Asn Tyr Pro Ala Tyr Met
            260                 265                 270

Asp Asn Tyr Leu Lys Glu Val Ile Asn Gln Val Glu Glu Glu Thr Gly
        275                 280                 285

Tyr Asn Leu Leu Thr Thr Gly Met Asp Val Tyr Thr Asn Val Asp Gln
    290                 295                 300

Glu Ala Gln Lys His Leu Trp Asp Ile Tyr Asn Thr Asp Glu Tyr Val
305                 310                 315                 320

Ala Tyr Pro Asp Asp Glu Leu Gln Val Ala Ser Thr Ile Val Asp Val
                325                 330                 335

Ser Asn Gly Lys Val Ile Ala Gln Leu Gly Ala Arg His Gln Ser Ser
            340                 345                 350

Asn Val Ser Phe Gly Ile Asn Gln Ala Val Glu Thr Asn Arg Asp Trp
        355                 360                 365

Gly Ser Thr Met Lys Pro Ile Thr Asp Tyr Ala Pro Ala Leu Glu Tyr
    370                 375                 380

Gly Val Tyr Asp Ser Thr Ala Thr Ile Val His Asp Glu Pro Tyr Asn
385                 390                 395                 400

Tyr Pro Gly Thr Asn Thr Pro Val Tyr Asn Trp Asp Arg Gly Tyr Phe
                405                 410                 415
```

```
Gly Asn Ile Thr Leu Gln Tyr Ala Leu Gln Gln Ser Arg Asn Val Pro
           420                 425                 430

Ala Val Glu Thr Leu Asn Lys Val Gly Leu Asn Arg Ala Lys Thr Phe
       435                 440                 445

Leu Asn Gly Leu Gly Ile Asp Tyr Pro Ser Ile His Tyr Ser Asn Ala
   450                 455                 460

Ile Ser Ser Asn Thr Thr Glu Ser Asp Lys Lys Tyr Gly Ala Ser Ser
465                 470                 475                 480

Glu Lys Met Ala Ala Ala Tyr Ala Ala Phe Ala Asn Gly Gly Thr Tyr
                485                 490                 495

Tyr Lys Pro Met Tyr Ile His Lys Val Val Phe Ser Asp Gly Ser Glu
           500                 505                 510

Lys Glu Phe Ser Asn Val Gly Thr Arg Ala Met Lys Glu Thr Thr Ala
       515                 520                 525

Tyr Met Met Thr Asp Met Met Lys Thr Val Leu Thr Tyr Gly Thr Gly
   530                 535                 540

Arg Asn Ala Tyr Leu Ala Trp Leu Pro Gln Ala Gly Lys Thr Gly Thr
545                 550                 555                 560

Ser Asn Tyr Thr Asp Glu Glu Ile Glu Asn His Ile Lys Thr Ser Gln
                565                 570                 575

Phe Val Ala Pro Asp Glu Leu Phe Ala Gly Tyr Thr Arg Lys Tyr Ser
           580                 585                 590

Met Ala Val Trp Thr Gly Tyr Ser Asn Arg Leu Thr Pro Leu Val Gly
       595                 600                 605

Asn Gly Leu Thr Val Ala Ala Lys Val Tyr Arg Ser Met Met Thr Tyr
   610                 615                 620

Leu Ser Glu Gly Ser Asn Pro Glu Asp Trp Asn Ile Pro Glu Gly Leu
625                 630                 635                 640
```

```
Tyr Arg Asn Gly Glu Phe Val Phe Lys Asn Gly Ala Arg Ser Thr Trp
                645                 650                 655

Asn Ser Pro Ala Pro Gln Gln Pro Pro Ser Thr Glu Ser Ser Ser Ser
            660                 665                 670

Ser Ser Asp Ser Ser Thr Ser Gln Ser Ser Ser Thr Thr Pro Ser Thr
        675                 680                 685

Asn Asn Ser Thr Thr Thr Asn Pro Asn Asn Asn Thr Gln Gln Ser Asn
    690                 695                 700

Thr Thr Pro Asp Gln Gln Asn Gln Asn Pro Gln Pro Ala Gln Pro
705                 710                 715

<210>  627
<211>  113
<212>  PRT
<213>  Streptococcus pneumoniae

<400>  627

Met Glu Arg Asp Met Ala Ser Ile Ile Phe Ser Ala Lys Asp Ile Phe
1               5                   10                  15

Glu Gln Glu Phe Gly Arg Glu Val Arg Gly Tyr Asn Lys Val Glu Val
            20                  25                  30

Asp Glu Phe Leu Asp Asp Val Ile Lys Asp Tyr Glu Thr Tyr Ala Ala
        35                  40                  45

Leu Val Lys Ser Leu Arg Gln Glu Ile Ala Asp Leu Lys Glu Glu Leu
    50                  55                  60

Thr Arg Lys Pro Lys Pro Ser Pro Val Gln Ala Glu Pro Leu Glu Ala
65                  70                  75                  80

Ala Ile Thr Ser Ser Met Thr Asn Phe Asp Ile Leu Lys Arg Leu Asn
                85                  90                  95

Arg Leu Glu Lys Glu Val Phe Gly Lys Gln Ile Leu Asp Asn Ser Asp
            100                 105                 110
```

Phe

<210> 628
<211> 464
<212> PRT
<213> Streptococcus pneumoniae

<400> 628

Met Ser Lys Lys Arg Arg Asn Arg His Lys Lys Glu Gly Gln Glu Pro
1 5 10 15

Gln Phe Asp Phe Asp Glu Ala Lys Glu Leu Thr Val Gly Gln Ala Ile
20 25 30

Arg Lys Asn Glu Glu Val Glu Ser Gly Val Leu Pro Glu Asp Ser Ile
35 40 45

Leu Asp Lys Tyr Val Lys Gln His Arg Asp Glu Ile Glu Ala Asp Lys
50 55 60

Phe Ala Thr Arg Gln Tyr Lys Lys Glu Glu Phe Val Glu Thr Gln Ser
65 70 75 80

Leu Asp Asp Leu Ile Gln Glu Met Arg Glu Ala Val Glu Lys Ser Glu
85 90 95

Ala Ser Ser Glu Glu Val Pro Ser Ser Glu Asp Ile Leu Leu Pro Leu
100 105 110

Pro Leu Asp Asp Glu Glu Gln Gly Leu Asp Pro Leu Leu Leu Asp Asp
115 120 125

Glu Asn Pro Thr Glu Met Thr Glu Glu Val Glu Glu Glu Gln Asn Leu
130 135 140

Ser Arg Leu Asp Gln Glu Asp Ser Glu Lys Lys Ser Lys Lys Gly Phe
145 150 155 160

Ile Leu Thr Val Leu Ala Leu Val Ser Val Ile Ile Cys Val Ser Ala
165 170 175

```
Tyr Tyr Val Tyr Arg Gln Val Ala Arg Ser Thr Lys Glu Ile Glu Thr
            180                 185                 190

Ser Gln Ser Thr Thr Ala Asn Gln Ser Asp Val Asp Asp Phe Asn Thr
        195                 200                 205

Leu Tyr Asp Ala Phe Tyr Thr Asp Ser Asn Lys Thr Ala Leu Lys Asn
    210                 215                 220

Ser Gln Phe Asp Lys Leu Ser Gln Leu Lys Thr Leu Leu Asp Lys Leu
225                 230                 235                 240

Glu Gly Ser Arg Glu His Thr Leu Ala Lys Ser Lys Tyr Asp Ser Leu
                245                 250                 255

Ala Thr Gln Ile Lys Ala Ile Gln Asp Val Asn Ala Gln Phe Glu Lys
            260                 265                 270

Pro Ala Ile Val Asp Gly Val Leu Asp Thr Asn Ala Lys Ala Lys Ser
        275                 280                 285

Asp Ala Lys Phe Thr Asp Ile Lys Thr Gly Asn Thr Glu Leu Asp Lys
    290                 295                 300

Val Leu Asp Lys Ala Ile Ser Leu Gly Lys Ser Gln Gln Thr Ser Thr
305                 310                 315                 320

Ser Ser Ser Ser Ser Ser Gln Thr Ser Ser Ser Ser Ser Ser Gln Ala
                325                 330                 335

Ser Ser Asn Thr Thr Ser Glu Pro Lys Pro Ser Ser Ser Asn Glu Thr
            340                 345                 350

Arg Ser Ser Arg Ser Glu Val Asn Met Gly Leu Ser Ser Ala Gly Val
        355                 360                 365

Ala Val Gln Arg Ser Ala Ser Arg Val Ala Tyr Asn Gln Ser Ala Ile
    370                 375                 380

Asp Asp Ser Asn Asn Ser Ala Trp Asp Phe Ala Asp Gly Val Leu Glu
```

385 390 395 400

Gln Ile Leu Ala Thr Ser Arg Ser Arg Gly Tyr Ile Thr Gly Asp Gln
405 410 415

Tyr Ile Leu Glu Arg Val Asn Ile Val Asn Gly Asn Gly Tyr Tyr Asn
420 425 430

Leu Tyr Lys Pro Asp Gly Thr Tyr Leu Phe Thr Leu Asn Cys Lys Thr
435 440 445

Gly Tyr Phe Val Gly Asn Gly Ala Gly His Ala Asp Asp Leu Asp Tyr
450 455 460

<210> 629
<211> 481
<212> PRT
<213> Streptococcus pneumoniae

<400> 629

Met Lys Gln Glu Glu Cys Gln Met Thr Lys Ala Asn Phe Gly Val Val
1 5 10 15

Gly Met Ala Val Met Gly Arg Asn Leu Ala Leu Asn Ile Glu Ser Arg
20 25 30

Gly Tyr Thr Val Ala Ile Tyr Asn Arg Ser Lys Glu Lys Thr Glu Asp
35 40 45

Val Ile Ala Cys His Pro Glu Lys Asn Phe Val Pro Ser Tyr Asp Val
50 55 60

Glu Ser Phe Val Asn Ser Ile Glu Lys Pro Arg Arg Ile Met Leu Met
65 70 75 80

Val Gln Ala Gly Pro Gly Thr Asp Ala Thr Ile Gln Ala Leu Leu Pro
85 90 95

His Leu Asp Lys Gly Asp Ile Leu Ile Asp Gly Gly Asn Thr Phe Tyr
100 105 110

Lys Asp Thr Ile Arg Arg Asn Glu Glu Leu Ala Asn Ser Gly Ile Asn

```
        115                 120                 125

Phe Ile Gly Thr Gly Val Ser Gly Gly Glu Lys Gly Ala Leu Glu Gly
    130                 135                 140

Pro Ser Ile Met Pro Gly Gly Gln Lys Glu Ala Tyr Glu Leu Val Ala
145                 150                 155                 160

Asp Val Leu Glu Glu Ile Ser Ala Lys Ala Pro Glu Asp Gly Lys Pro
                165                 170                 175

Cys Val Thr Tyr Ile Gly Pro Asp Gly Ala Gly His Tyr Val Lys Met
            180                 185                 190

Val His Asn Gly Ile Glu Tyr Gly Asp Met Gln Leu Ile Ala Glu Ser
        195                 200                 205

Tyr Asp Leu Met Gln His Leu Leu Gly Leu Ser Ala Glu Asp Met Ala
    210                 215                 220

Glu Ile Phe Thr Glu Trp Asn Lys Gly Glu Leu Asp Ser Tyr Leu Ile
225                 230                 235                 240

Glu Ile Thr Ala Asp Ile Leu Ser Arg Lys Asp Asp Glu Gly Gln Asp
                245                 250                 255

Gly Pro Ile Val Asp Tyr Ile Leu Asp Ala Ala Gly Asn Lys Gly Thr
            260                 265                 270

Gly Lys Trp Thr Ser Gln Ser Ser Leu Asp Leu Gly Val Pro Leu Ser
        275                 280                 285

Leu Ile Thr Glu Ser Val Phe Ala Arg Tyr Ile Ser Thr Tyr Lys Glu
    290                 295                 300

Glu Arg Val His Ala Ser Lys Val Leu Pro Lys Pro Ala Ala Phe Asn
305                 310                 315                 320

Phe Glu Gly Asp Lys Ala Glu Leu Ile Glu Lys Ile Arg Gln Ala Leu
                325                 330                 335
```

```
Tyr Phe Ser Lys Ile Ile Ser Tyr Ala Gln Gly Phe Ala Gln Leu Arg
            340                 345                 350

Val Ala Ser Lys Glu Asn Asn Trp Asn Leu Pro Phe Ala Asp Ile Ala
        355                 360                 365

Ser Ile Trp Arg Asp Gly Cys Ile Ile Arg Ser Arg Phe Leu Gln Lys
    370                 375                 380

Ile Thr Asp Ala Tyr Asn Arg Asp Ala Asp Leu Ala Asn Leu Leu Leu
385                 390                 395                 400

Asp Glu Tyr Phe Leu Asp Val Thr Ala Lys Tyr Gln Gln Ala Val Arg
                405                 410                 415

Asp Ile Val Ala Leu Ala Val Gln Ala Gly Val Pro Val Pro Thr Phe
            420                 425                 430

Ser Ala Ala Ile Thr Tyr Phe Asp Ser Tyr Arg Ser Ala Asp Leu Pro
        435                 440                 445

Ala Asn Leu Ile Gln Ala Gln Arg Asp Tyr Phe Gly Ala His Thr Tyr
    450                 455                 460

Gln Arg Lys Asp Lys Glu Gly Thr Phe His Tyr Ser Trp Tyr Asp Glu
465                 470                 475                 480

Lys
```

<210> 630
<211> 144
<212> PRT
<213> Streptococcus pneumoniae

<400> 630

```
Met Asp Tyr Gln Arg Ile Asn Glu Tyr Leu Thr Ser Ile Phe Asn Asn
1               5                   10                  15

Val Leu Val Ile Glu Glu Val Asn Leu Arg Gly Ser Arg Phe Lys Asp
            20                  25                  30
```

```
Ile Ser Ile Lys Glu Met His Thr Ile Asp Val Ile Gly Lys Ala Pro
        35                  40                  45

Asp Val Thr Pro Ser Gln Val Ser Lys Glu Leu Met Val Thr Leu Gly
    50                  55                  60

Thr Val Thr Thr Ser Leu Asn Asn Leu Glu Arg Lys Gly Tyr Ile Glu
65                  70                  75                  80

Arg Val Arg Ser Glu Gln Asp Arg Arg Val Val His Leu His Leu Thr
                85                  90                  95

Lys Lys Gly Arg Leu Ile His Arg Leu His Lys Arg Phe His Lys Ala
            100                 105                 110

Met Val Glu Lys Ile Ile Asp Gly Met Ser Glu Glu Glu Ile Ala Val
        115                 120                 125

Met Gly Lys Gly Leu Thr Asn Leu Tyr Gln Phe Leu Glu Asp Leu Lys
    130                 135                 140

<210>  631
<211>  74
<212>  PRT
<213>  Streptococcus pneumoniae

<400>  631

Met Ala Val Phe Glu Lys Val Gln Glu Ile Ile Val Glu Glu Leu Gly
1               5                   10                  15

Lys Asp Ala Ser Glu Val Thr Leu Glu Ser Thr Phe Asp Asp Leu Asp
            20                  25                  30

Ala Asp Ser Leu Asp Leu Phe Gln Val Ile Ser Glu Ile Glu Asp Ala
        35                  40                  45

Phe Asp Ile Gln Ile Glu Ala Glu Asn Asp Leu Lys Thr Val Gly Asp
    50                  55                  60

Leu Val Ala Tyr Val Glu Glu Gln Ala Lys
65                  70
```

<210> 632
<211> 774
<212> PRT
<213> Streptococcus pneumoniae

<400> 632

Met Val Val Lys Thr Val Val Glu Ala Gln Asp Ile Phe Asp Lys Ala
1 5 10 15

Trp Glu Gly Phe Lys Gly Val Asp Trp Lys Glu Lys Ala Ser Val Ser
20 25 30

Arg Phe Val Gln Ala Asn Tyr Thr Pro Tyr Asp Gly Asp Glu Ser Phe
35 40 45

Leu Ala Gly Pro Thr Glu Arg Ser Leu His Ile Lys Lys Ile Val Glu
50 55 60

Glu Thr Lys Ala His Tyr Glu Glu Thr Arg Phe Pro Met Asp Thr Arg
65 70 75 80

Pro Thr Ser Ile Ala Asp Ile Pro Ala Gly Phe Ile Asp Lys Glu Asn
85 90 95

Glu Val Ile Phe Gly Ile Gln Asn Asp Glu Leu Phe Lys Leu Asn Phe
100 105 110

Met Pro Lys Gly Gly Ile Arg Met Ala Glu Thr Thr Leu Lys Glu Asn
115 120 125

Gly Tyr Glu Pro Asp Pro Ala Val His Glu Ile Phe Thr Lys Tyr Val
130 135 140

Thr Thr Val Asn Asp Gly Ile Phe Arg Ala Tyr Thr Ser Asn Ile Arg
145 150 155 160

Arg Ala Arg His Ala His Thr Val Thr Gly Leu Pro Asp Ala Tyr Ser
165 170 175

Arg Gly Arg Ile Ile Gly Val Tyr Ala Arg Leu Ala Leu Tyr Gly Ala
180 185 190

```
Asp Tyr Leu Met Gln Glu Lys Val Asn Asp Trp Asn Ala Ile Lys Glu
        195                 200                 205

Ile Asp Glu Glu Thr Ile Arg Leu Arg Glu Glu Val Asn Leu Gln Tyr
    210                 215                 220

Gln Ala Leu Gln Gln Val Val Arg Leu Gly Asp Leu Tyr Gly Val Asp
225                 230                 235                 240

Val Arg Lys Pro Ala Met Asn Val Lys Glu Ala Ile Gln Trp Val Asn
                245                 250                 255

Ile Ala Phe Met Ala Val Cys Arg Val Ile Asn Gly Ala Ala Thr Ser
            260                 265                 270

Leu Gly Arg Val Pro Ile Val Leu Asp Ile Phe Ala Glu Arg Asp Leu
        275                 280                 285

Ala Arg Gly Thr Phe Thr Glu Ser Glu Ile Gln Glu Phe Val Asp Asp
    290                 295                 300

Phe Val Met Lys Leu Arg Thr Val Lys Phe Ala Arg Thr Lys Ala Tyr
305                 310                 315                 320

Asp Gln Leu Tyr Ser Gly Asp Pro Thr Phe Ile Thr Thr Ser Met Ala
                325                 330                 335

Gly Met Gly Asn Asp Gly Arg His Arg Val Thr Lys Met Asp Tyr Arg
            340                 345                 350

Phe Leu Asn Thr Leu Asp Asn Ile Gly Asn Ser Pro Glu Pro Asn Leu
        355                 360                 365

Thr Val Leu Trp Thr Asp Lys Leu Pro Tyr Asn Phe Arg Arg Tyr Cys
    370                 375                 380

Met His Met Ser His Lys His Ser Ser Ile Gln Tyr Glu Gly Val Thr
385                 390                 395                 400

Thr Met Ala Lys Asp Gly Tyr Gly Glu Met Ser Cys Ile Ser Cys Cys
                405                 410                 415
```

```
Val Ser Pro Leu Asp Pro Glu Asn Glu Glu Gln Arg His Asn Ile Gln
            420                 425                 430

Tyr Phe Gly Ala Arg Val Asn Val Leu Lys Ala Leu Leu Thr Gly Leu
        435                 440                 445

Asn Gly Gly Tyr Asp Asp Val His Lys Asp Tyr Lys Val Phe Asp Ile
    450                 455                 460

Glu Pro Ile Arg Asp Glu Val Leu Glu Phe Glu Ser Val Lys Ala Asn
465                 470                 475                 480

Phe Glu Lys Ser Leu Asp Trp Leu Thr Asp Thr Tyr Val Asp Ala Leu
                485                 490                 495

Asn Ile Ile His Tyr Met Thr Asp Arg Tyr Asn Tyr Glu Ala Val Gln
            500                 505                 510

Met Ala Phe Leu Pro Thr Lys Gln Arg Ala Asn Met Gly Phe Gly Ile
        515                 520                 525

Cys Gly Phe Ala Asn Thr Val Asp Thr Leu Ser Ala Ile Lys Tyr Ala
    530                 535                 540

Thr Val Lys Pro Ile Arg Asp Glu Asp Gly Tyr Ile Tyr Asp Tyr Glu
545                 550                 555                 560

Thr Ile Gly Asp Tyr Pro Arg Trp Gly Glu Asp Asp Pro Arg Ser Asn
                565                 570                 575

Glu Leu Ala Glu Trp Leu Ile Glu Ala Tyr Thr Thr Arg Leu Arg Ser
            580                 585                 590

His Lys Leu Tyr Lys Asp Ala Glu Ala Thr Val Ser Leu Leu Thr Ile
        595                 600                 605

Thr Ser Asn Val Ala Tyr Ser Lys Gln Thr Gly Asn Ser Pro Val His
    610                 615                 620

Lys Gly Val Tyr Leu Asn Glu Asp Gly Ser Val Asn Leu Ser Lys Leu
625                 630                 635                 640
```

```
Glu Phe Phe Ser Pro Gly Ala Asn Pro Ser Asn Lys Ala Lys Gly Gly
                645                 650                 655

Trp Leu Gln Asn Leu Asn Ser Leu Ser Ser Leu Asp Phe Ser Tyr Ala
            660                 665                 670

Ala Asp Gly Ile Ser Leu Thr Thr Gln Val Ser Pro Arg Ala Leu Gly
        675                 680                 685

Lys Thr Arg Asp Glu Gln Val Asp Asn Leu Val Thr Ile Leu Asp Gly
    690                 695                 700

Tyr Phe Glu Asn Gly Gly Gln His Val Asn Leu Asn Val Met Asp Leu
705                 710                 715                 720

Asn Asp Val Tyr Glu Lys Ile Met Ser Gly Glu Asp Val Ile Val Arg
                725                 730                 735

Ile Ser Gly Tyr Cys Val Asn Thr Lys Tyr Leu Thr Pro Glu Gln Lys
            740                 745                 750

Thr Glu Leu Thr Gln Arg Val Phe His Glu Val Leu Ser Met Asp Asp
        755                 760                 765

Ala Leu Asp Ala Leu Ser
    770
```

<210> 633
<211> 535
<212> PRT
<213> Streptococcus pneumoniae

<400> 633

```
Met Ser Thr Lys Tyr Ile Phe Val Thr Gly Gly Val Val Ser Ser Ile
1               5                   10                  15

Gly Lys Gly Ile Val Ala Ala Ser Leu Gly Arg Leu Leu Lys Asn Arg
            20                  25                  30

Gly Leu Lys Val Thr Ile Gln Lys Phe Asp Pro Tyr Ile Asn Ile Asp
        35                  40                  45
```

```
Pro Gly Thr Met Ser Pro Tyr Gln His Gly Glu Val Phe Val Thr Asp
    50                  55                  60

Asp Gly Ala Glu Thr Asp Leu Asp Leu Gly His Tyr Glu Arg Phe Ile
65                  70                  75                  80

Asp Ile Asn Leu Asn Lys Tyr Ser Asn Val Thr Thr Gly Lys Ile Tyr
                85                  90                  95

Ser Glu Val Leu Arg Lys Glu Arg Arg Gly Glu Tyr Leu Gly Ala Thr
            100                 105                 110

Val Gln Val Ile Pro His Ile Thr Asp Ala Leu Lys Glu Lys Ile Lys
        115                 120                 125

Arg Ala Ala Leu Thr Thr Asp Ser Asp Val Ile Ile Thr Glu Val Gly
    130                 135                 140

Gly Thr Val Gly Asp Ile Glu Ser Leu Pro Phe Leu Glu Ala Leu Arg
145                 150                 155                 160

Gln Met Lys Ala Asp Val Gly Ala Asp Asn Val Met Tyr Ile His Thr
                165                 170                 175

Thr Leu Leu Pro Tyr Leu Lys Ala Ala Gly Glu Met Lys Thr Lys Pro
            180                 185                 190

Thr Gln His Ser Val Lys Glu Leu Arg Gly Leu Gly Ile Gln Pro Asn
        195                 200                 205

Met Leu Val Ile Arg Thr Glu Glu Pro Ala Gly Gln Gly Ile Lys Asn
    210                 215                 220

Lys Leu Ala Gln Phe Cys Asp Val Ala Pro Glu Ala Val Ile Glu Ser
225                 230                 235                 240

Leu Asp Val Glu His Leu Tyr Gln Ile Pro Leu Asn Leu Gln Ala Gln
                245                 250                 255

Gly Met Asp Gln Ile Val Cys Asp His Leu Lys Leu Asp Ala Pro Ala
```

```
            260                 265                 270

Ala Asp Met Thr Glu Trp Ser Ala Met Val Asp Lys Val Met Asn Leu
        275                 280                 285

Lys Lys Gln Val Lys Ile Ser Leu Val Gly Lys Tyr Val Glu Leu Gln
    290                 295                 300

Asp Ala Tyr Ile Ser Val Val Glu Ala Leu Lys His Ser Gly Tyr Val
305                 310                 315                 320

Asn Asp Ala Glu Val Lys Ile Asn Trp Val Asn Ala Asn Asp Val Thr
                325                 330                 335

Ala Glu Asn Val Ala Glu Leu Leu Ser Asp Ala Asp Gly Ile Ile Val
            340                 345                 350

Pro Gly Gly Phe Gly Gln Arg Gly Thr Glu Gly Lys Ile Gln Ala Ile
        355                 360                 365

Arg Tyr Ala Arg Glu Asn Asp Val Pro Met Leu Gly Val Cys Leu Gly
    370                 375                 380

Met Gln Leu Thr Cys Ile Glu Phe Ala Arg His Val Leu Gly Leu Glu
385                 390                 395                 400

Gly Ala Asn Ser Ala Glu Leu Ala Pro Glu Thr Lys Tyr Pro Ile Ile
                405                 410                 415

Asp Ile Met Arg Asp Gln Ile Asp Ile Glu Asp Met Gly Gly Thr Leu
            420                 425                 430

Arg Leu Gly Leu Tyr Pro Ser Lys Leu Lys Arg Gly Ser Lys Ala Ala
        435                 440                 445

Ala Ala Tyr His Asn Gln Glu Val Val Gln Arg Arg His Arg His Arg
    450                 455                 460

Tyr Glu Phe Asn Asn Ala Phe Arg Glu Gln Phe Glu Ala Ala Gly Phe
465                 470                 475                 480
```

```
Val Phe Ser Gly Val Ser Pro Asp Asn Arg Leu Val Glu Ile Val Glu
                485                 490                 495

Ile Pro Glu Asn Lys Phe Phe Val Ala Cys Gln Tyr His Pro Glu Leu
            500                 505                 510

Ser Ser Arg Pro Asn Arg Pro Glu Glu Leu Tyr Thr Ala Phe Val Thr
        515                 520                 525

Ala Ala Val Glu Asn Ser Asn
    530                 535

<210>  634
<211>  378
<212>  PRT
<213>  Streptococcus pneumoniae

<400>  634

Met Asn Asn Thr Glu Phe Tyr Asp Arg Leu Gly Val Ser Lys Asn Ala
1               5                   10                  15

Ser Ala Asp Glu Ile Lys Lys Ala Tyr Arg Lys Leu Ser Lys Lys Tyr
            20                  25                  30

His Pro Asp Ile Asn Lys Glu Pro Gly Ala Glu Asp Lys Tyr Lys Glu
        35                  40                  45

Val Gln Glu Ala Tyr Glu Thr Leu Ser Asp Asp Gln Lys Arg Ala Ala
    50                  55                  60

Tyr Asp Gln Tyr Gly Ala Ala Gly Ala Asn Gly Gly Phe Gly Gly Ala
65                  70                  75                  80

Gly Gly Phe Gly Gly Phe Asn Gly Ala Gly Gly Phe Gly Gly Phe Glu
                85                  90                  95

Asp Ile Phe Ser Ser Phe Phe Gly Gly Gly Gly Ser Ser Arg Asn Pro
            100                 105                 110

Asn Ala Pro Arg Gln Gly Asp Asp Leu Gln Tyr Arg Val Asn Leu Thr
        115                 120                 125
```

```
Phe Glu Glu Ala Ile Phe Gly Thr Glu Lys Glu Val Lys Tyr His Arg
    130                 135                 140

Glu Ala Gly Cys Arg Thr Cys Asn Gly Ser Gly Ala Lys Pro Gly Thr
145                 150                 155                 160

Ser Pro Val Thr Cys Gly Arg Cys His Gly Ala Gly Val Ile Asn Val
                165                 170                 175

Asp Thr Gln Thr Pro Leu Gly Met Met Arg Arg Gln Val Thr Cys Asp
            180                 185                 190

Val Cys His Gly Arg Gly Lys Glu Ile Lys Tyr Pro Cys Thr Thr Cys
        195                 200                 205

His Gly Thr Gly His Glu Lys Gln Ala His Ser Val His Val Lys Ile
    210                 215                 220

Pro Ala Gly Val Glu Thr Gly Gln Gln Ile Arg Leu Ala Gly Gln Gly
225                 230                 235                 240

Glu Ala Gly Phe Asn Gly Gly Pro Tyr Gly Asp Leu Tyr Val Val Val
                245                 250                 255

Ser Val Glu Ala Ser Asp Lys Phe Glu Arg Glu Gly Thr Thr Ile Phe
            260                 265                 270

Tyr Asn Leu Asn Leu Asn Phe Val Gln Ala Ala Leu Gly Asp Thr Val
        275                 280                 285

Asp Ile Pro Thr Val His Gly Asp Val Glu Leu Val Ile Pro Glu Gly
    290                 295                 300

Thr Gln Thr Gly Lys Lys Phe Arg Leu Arg Ser Lys Gly Ala Pro Ser
305                 310                 315                 320

Leu Arg Gly Gly Ala Val Gly Asp Gln Tyr Val Thr Val Asn Val Val
                325                 330                 335

Thr Pro Thr Gly Leu Asn Asp Arg Gln Lys Val Ala Leu Lys Glu Phe
            340                 345                 350
```

```
Ala Ala Ala Gly Asp Leu Lys Val Asn Pro Lys Lys Lys Gly Phe Phe
        355                 360                 365

Asp His Ile Lys Asp Ala Phe Asp Gly Glu
    370                 375
```

<210> 635
<211> 95
<212> PRT
<213> Streptococcus pneumoniae

<400> 635

```
Met Lys Leu Ser Asn Leu Leu Leu Phe Ala Gly Ala Ala Ala Gly Ser
1               5                   10                  15

Tyr Leu Val Thr Lys Asn Arg Gln Thr Ile Thr Asp Glu Val Leu Asn
            20                  25                  30

Thr Thr Asp Arg Val Gln Ala Ile Lys Asp Asp Val Asp Ile Ile Gln
        35                  40                  45

Asn Ser Leu Gln Ile Ile Asn Gln Gln Lys Glu Leu Ile Lys Glu Tyr
    50                  55                  60

Gln Glu Asp Leu Thr Tyr Lys Phe Lys Val Leu Glu Lys Asp Ile Gln
65                  70                  75                  80

Thr Arg Leu Ala Val Ile Lys Glu Met Gln Gly Thr Glu Asp Lys
                85                  90                  95
```

<210> 636
<211> 378
<212> PRT
<213> Streptococcus pneumoniae

<400> 636

```
Met Ser Lys Glu Met Leu Glu Ala Phe Arg Ile Leu Glu Glu Asp Lys
1               5                   10                  15

Gly Ile Lys Lys Glu Asp Ile Ile Asp Ala Val Val Glu Ser Leu Arg
            20                  25                  30
```

```
Ser Ala Tyr Arg Arg Arg Tyr Gly Gln Ser Asp Ser Val Ala Ile Asp
        35                  40                  45

Phe Asn Glu Lys Thr Gly Asp Phe Thr Val Tyr Thr Val Arg Glu Val
    50                  55                  60

Val Asp Glu Val Phe Asp Ser Arg Leu Glu Ile Ser Leu Lys Asp Ala
65                  70                  75                  80

Leu Ala Ile Asn Ser Ala Tyr Glu Leu Gly Asp Lys Ile Lys Phe Glu
                85                  90                  95

Glu Ala Pro Ala Glu Phe Gly Arg Val Ala Ala Gln Ser Ala Lys Gln
            100                 105                 110

Thr Ile Met Glu Lys Met Arg Lys Gln Thr Arg Ala Ile Thr Tyr Asn
        115                 120                 125

Thr Tyr Lys Glu His Glu Gln Glu Ile Met Ser Gly Thr Val Glu Arg
    130                 135                 140

Phe Asp Asn Arg Phe Ile Tyr Val Asn Leu Gly Ser Ile Glu Ala Gln
145                 150                 155                 160

Leu Ser Lys Gln Asp Gln Ile Pro Gly Glu Val Phe Ala Ser His Asp
                165                 170                 175

Arg Ile Glu Val Tyr Val Tyr Lys Val Glu Asp Asn Pro Arg Gly Val
            180                 185                 190

Asn Val Phe Val Ser Arg Ser His Pro Glu Met Ile Lys Arg Leu Met
        195                 200                 205

Glu Gln Glu Ile Pro Glu Val Tyr Asp Gly Thr Val Glu Ile Met Ser
    210                 215                 220

Val Ala Arg Glu Ala Gly Asp Arg Thr Lys Val Ala Val Arg Ser His
225                 230                 235                 240

Asn Pro Asn Val Asp Ala Ile Gly Thr Ile Val Gly Arg Gly Gly Ala
                245                 250                 255
```

```
Asn Ile Lys Lys Ile Thr Ser Lys Phe His Pro Ala Arg Tyr Asp Ala
            260                 265                 270

Lys Asn Asp Arg Met Val Pro Ile Glu Glu Asn Ile Asp Val Ile Glu
        275                 280                 285

Trp Val Ala Asp Pro Ala Glu Phe Ile Tyr Asn Ala Ile Ala Pro Ala
    290                 295                 300

Glu Val Asp Gln Val Ile Phe Asp Glu Asn Asp Ser Lys Arg Ala Leu
305                 310                 315                 320

Val Val Val Pro Asp Asn Lys Leu Ser Leu Ala Ile Gly Arg Arg Gly
                325                 330                 335

Gln Asn Val Arg Leu Ala Ala His Leu Thr Gly Tyr Arg Ile Asp Ile
            340                 345                 350

Lys Ser Ala Ser Glu Phe Glu Ala Met Glu Asp Ala Ala Ser Val Glu
        355                 360                 365

Leu Glu Val Glu Asn Asp Thr Val Glu Glu
    370                 375

<210>  637
<211>  958
<212>  PRT
<213>  Streptococcus pneumoniae

<400>  637

Met Ser Lys Lys Arg Leu Tyr Glu Ile Ala Lys Glu Leu Gly Lys Glu
1               5                   10                  15

Ser Lys Glu Val Val Ala Arg Ala Lys Glu Leu Gly Leu Asp Val Lys
            20                  25                  30

Ser His Ser Ser Ser Val Glu Glu Ala Val Ala Ala Lys Ile Ala Ala
        35                  40                  45

Ser Phe Lys Pro Ala Ala Ala Pro Lys Val Glu Ala Lys Pro Ala Ala
    50                  55                  60
```

```
Pro Lys Val Ser Ala Glu Lys Lys Ala Glu Lys Ser Glu Pro Ala Lys
65                  70                  75                  80

Pro Ala Val Ala Lys Glu Glu Ala Lys Pro Ala Ala Pro Lys Ala Ser
                85                  90                  95

Ala Glu Lys Lys Ala Glu Lys Ser Glu Pro Val Lys Pro Ala Val Ala
            100                 105                 110

Lys Glu Glu Ala Lys Pro Ala Glu Pro Val Thr Pro Lys Thr Glu Lys
        115                 120                 125

Val Ala Ala Lys Pro Gln Ser Arg Asn Phe Lys Ala Glu Arg Glu Ala
    130                 135                 140

Arg Ala Lys Glu Gln Ala Glu Arg Arg Lys Gln Asn Lys Gly Asn Asn
145                 150                 155                 160

Arg Asp Gln Gln Gln Asn Gly Asn Arg Gln Lys Asn Asp Gly Arg Asn
                165                 170                 175

Gly Gly Lys Gln Gly Gln Ser Asn Arg Asp Asn Arg Arg Phe Asn Asp
            180                 185                 190

Gln Ala Lys Lys Gln Gln Gly Gln Gln Lys Arg Arg Asn Glu Arg Arg
        195                 200                 205

Gln Gln Glu Asp Lys Arg Ser Asn Gln Ala Ala Pro Arg Ile Asp Phe
    210                 215                 220

Lys Ala Arg Ala Ala Ala Leu Lys Ala Glu Gln Asn Ala Glu Tyr Ala
225                 230                 235                 240

Arg Ser Ser Glu Glu Arg Phe Lys Gln Tyr Gln Ala Ala Lys Glu Ala
                245                 250                 255

Leu Ala Gln Ala Asn Lys Arg Lys Glu Pro Glu Glu Ile Phe Glu Glu
            260                 265                 270

Ala Ala Lys Leu Ala Glu Gln Ala Gln Gln Val Gln Ala Val Val Glu
        275                 280                 285
```

```
Val Val Pro Glu Lys Lys Glu Pro Ala Val Asp Thr Arg Arg Lys Lys
    290                 295                 300

Gln Ala Arg Pro Asp Lys Asn Arg Asp Asp Tyr Asp His Glu Glu Asp
305                 310                 315                 320

Gly Pro Arg Lys Gln Gln Lys Asn Arg Ser Ser Gln Asn Gln Val Arg
                325                 330                 335

Asn Gln Lys Asn Ser Asn Trp Asn Asn Asn Lys Lys Asn Lys Lys Gly
            340                 345                 350

Asn Asn Lys Asn Asn Arg Asn Gln Thr Pro Lys Pro Val Thr Glu Arg
        355                 360                 365

Lys Phe His Glu Leu Pro Thr Glu Phe Glu Tyr Thr Asp Gly Met Thr
    370                 375                 380

Val Ala Glu Ile Ala Lys Arg Ile Lys Arg Glu Pro Ala Glu Ile Val
385                 390                 395                 400

Lys Lys Leu Phe Met Met Gly Val Met Ala Thr Gln Asn Gln Ser Leu
                405                 410                 415

Asp Gly Glu Thr Ile Glu Leu Leu Met Val Asp Tyr Gly Ile Glu Ala
            420                 425                 430

Lys Gln Lys Val Glu Val Asp Asn Ala Asp Ile Glu Arg Phe Phe Val
        435                 440                 445

Glu Asp Gly Tyr Leu Asn Glu Asp Glu Leu Val Glu Arg Pro Pro Val
    450                 455                 460

Val Thr Ile Met Gly His Val Asp His Gly Lys Thr Thr Leu Leu Asp
465                 470                 475                 480

Thr Leu Arg Asn Ser Arg Val Ala Thr Gly Glu Ala Gly Gly Ile Thr
                485                 490                 495

Gln His Ile Gly Ala Tyr Gln Ile Val Glu Asn Gly Lys Lys Ile Thr
```

```
            500                 505                 510

Phe Leu Asp Thr Pro Gly His Ala Ala Phe Thr Ser Met Arg Ala Arg
        515                 520                 525

Gly Ala Ser Val Thr Asp Ile Thr Ile Leu Val Val Ala Ala Asp Asp
    530                 535                 540

Gly Val Met Pro Gln Thr Ile Glu Ala Ile Asn His Ser Lys Ala Ala
545                 550                 555                 560

Asn Val Pro Ile Ile Val Ala Ile Asn Lys Ile Asp Lys Pro Gly Ala
                565                 570                 575

Asn Pro Glu Arg Val Ile Gly Glu Leu Ala Glu His Gly Val Met Ser
            580                 585                 590

Thr Ala Trp Gly Gly Asp Ser Glu Phe Val Glu Ile Ser Ala Lys Phe
        595                 600                 605

Asn Gln Asn Ile Glu Glu Leu Leu Glu Thr Val Leu Leu Val Ala Glu
    610                 615                 620

Ile Gln Glu Leu Lys Ala Asp Pro Thr Val Arg Ala Ile Gly Thr Val
625                 630                 635                 640

Ile Glu Ala Arg Leu Asp Lys Gly Lys Gly Ala Val Ala Thr Leu Leu
                645                 650                 655

Val Gln Gln Gly Thr Leu Asn Val Gln Asp Pro Ile Val Val Gly Asn
            660                 665                 670

Thr Phe Gly Arg Val Arg Ala Met Thr Asn Asp Leu Gly Arg Arg Val
        675                 680                 685

Lys Val Ala Gly Pro Ser Thr Pro Val Ser Ile Thr Gly Leu Asn Glu
    690                 695                 700

Ala Pro Met Ala Gly Asp His Phe Ala Val Tyr Glu Asp Glu Lys Ser
705                 710                 715                 720
```

```
Ala Arg Ala Ala Gly Glu Glu Arg Ala Lys Arg Ala Leu Met Lys Gln
                725                 730                 735

Arg Gln Ala Thr Gln Arg Val Ser Leu Glu Asn Leu Phe Asp Thr Leu
            740                 745                 750

Lys Ala Gly Glu Leu Lys Ser Val Asn Val Ile Ile Lys Ala Asp Val
        755                 760                 765

Gln Gly Ser Val Glu Ala Leu Ser Ala Ser Leu Gln Lys Ile Asp Val
    770                 775                 780

Glu Gly Val Lys Val Thr Ile Val His Ser Ala Val Gly Ala Ile Asn
785                 790                 795                 800

Glu Ser Asp Val Thr Leu Ala Glu Ala Ser Asn Ala Phe Ile Val Gly
                805                 810                 815

Phe Asn Val Arg Pro Thr Pro Gln Ala Arg Gln Gln Ala Glu Ala Asp
            820                 825                 830

Asp Val Glu Ile Arg Leu His Ser Ile Ile Tyr Lys Val Ile Glu Glu
        835                 840                 845

Met Glu Glu Ala Met Lys Gly Met Leu Asp Pro Glu Phe Glu Glu Lys
    850                 855                 860

Val Ile Gly Glu Ala Val Ile Arg Glu Thr Phe Lys Val Ser Lys Val
865                 870                 875                 880

Gly Thr Ile Gly Gly Phe Met Val Ile Asn Gly Lys Val Ala Arg Asp
                885                 890                 895

Ser Lys Val Arg Val Ile Arg Asp Gly Val Val Ile Tyr Asp Gly Glu
            900                 905                 910

Leu Ala Ser Leu Lys His Tyr Lys Asp Asp Val Lys Glu Val Thr Asn
        915                 920                 925

Gly Arg Glu Gly Gly Leu Met Ile Asp Gly Tyr Asn Asp Ile Lys Met
    930                 935                 940
```

```
Asp Asp Val Ile Glu Ala Tyr Val Met Glu Glu Ile Lys Arg
945                 950                 955


<210>  638
<211>  293
<212>  PRT
<213>  Streptococcus pneumoniae

<400>  638

Met Ala Ile Val Ser Ala Glu Lys Phe Val Gln Ala Ala Arg Asp Asn
1               5                   10                  15


Gly Tyr Ala Val Gly Gly Phe Asn Thr Asn Asn Leu Glu Trp Thr Gln
            20                  25                  30


Ala Ile Leu Arg Ala Ala Glu Ala Lys Lys Ala Pro Val Leu Ile Gln
        35                  40                  45


Thr Ser Met Gly Ala Ala Lys Tyr Met Gly Gly Tyr Lys Val Ala Arg
    50                  55                  60


Asn Leu Ile Ala Asn Leu Val Glu Ser Met Gly Ile Thr Val Pro Val
65                  70                  75                  80


Ala Ile His Leu Asp His Gly His Tyr Glu Asp Ala Leu Glu Cys Ile
                85                  90                  95


Glu Val Gly Tyr Thr Ser Ile Met Phe Asp Gly Ser His Leu Pro Val
            100                 105                 110


Glu Glu Asn Leu Lys Leu Ala Lys Glu Val Val Glu Lys Ala His Ala
        115                 120                 125


Lys Gly Ile Ser Val Glu Ala Glu Val Gly Thr Ile Gly Gly Glu Glu
    130                 135                 140


Asp Gly Ile Ile Gly Lys Gly Glu Leu Ala Pro Ile Glu Asp Ala Lys
145                 150                 155                 160


Ala Met Val Glu Thr Gly Ile Asp Phe Leu Ala Ala Gly Ile Gly Asn
                165                 170                 175
```

```
Ile His Gly Pro Tyr Pro Val Asn Trp Glu Gly Leu Asp Leu Asp His
            180                 185                 190

Leu Gln Lys Leu Thr Glu Ala Leu Pro Gly Phe Pro Ile Val Leu His
        195                 200                 205

Gly Gly Ser Gly Ile Pro Asp Glu Gln Ile Gln Ala Ala Ile Lys Leu
    210                 215                 220

Gly Val Ala Lys Val Asn Val Asn Thr Glu Cys Gln Ile Ala Phe Ala
225                 230                 235                 240

Asn Ala Thr Arg Lys Phe Ala Arg Asp Tyr Glu Ala Asn Glu Ala Glu
                245                 250                 255

Tyr Asp Lys Lys Lys Leu Phe Asp Pro Arg Lys Phe Leu Ala Asp Gly
            260                 265                 270

Val Lys Ala Ile Gln Ala Ser Val Glu Glu Arg Ile Asp Val Phe Gly
        275                 280                 285

Ser Glu Gly Lys Ala
    290
```

<210> 639
<211> 141
<212> PRT
<213> Streptococcus pneumoniae

<400> 639

```
Met Ala Lys Lys Val Glu Lys Leu Val Lys Leu Gln Ile Pro Ala Gly
1               5                   10                  15

Lys Ala Thr Pro Ala Pro Pro Val Gly Pro Ala Leu Gly Gln Ala Gly
            20                  25                  30

Ile Asn Ile Met Gly Phe Thr Lys Glu Phe Asn Ala Arg Thr Ala Asp
        35                  40                  45

Gln Ala Gly Met Ile Ile Pro Val Val Ile Ser Val Tyr Glu Asp Lys
    50                  55                  60
```

```
Ser Phe Thr Phe Val Thr Lys Thr Pro Pro Ala Ala Val Leu Leu Lys
65                  70                  75                  80

Lys Ala Ala Gly Val Glu Lys Gly Ser Gly Thr Pro Asn Lys Thr Lys
                85                  90                  95

Val Ala Thr Val Thr Arg Ala Gln Val Gln Glu Ile Ala Glu Thr Lys
            100                 105                 110

Met Pro Asp Leu Asn Ala Ala Asn Val Glu Ser Ala Met Arg Met Ile
        115                 120                 125

Glu Gly Thr Ala Arg Ser Met Gly Phe Thr Val Val Asp
    130                 135                 140
```

<210> 640
<211> 229
<212> PRT
<213> Streptococcus pneumoniae

<400> 640

```
Met Ala Lys Lys Ser Lys Gln Leu Arg Ala Ala Leu Glu Lys Ile Asp
1               5                   10                  15

Ser Thr Lys Ala Tyr Ser Val Glu Glu Ala Val Ala Leu Ala Lys Glu
            20                  25                  30

Thr Asn Phe Ala Lys Phe Asp Ala Thr Val Glu Val Ala Tyr Asn Leu
        35                  40                  45

Asn Ile Asp Val Lys Lys Ala Asp Gln Gln Ile Arg Gly Ala Met Val
    50                  55                  60

Leu Pro Asn Gly Thr Gly Lys Thr Ser Arg Val Leu Val Phe Ala Arg
65                  70                  75                  80

Gly Ala Lys Ala Glu Glu Ala Lys Ala Ala Gly Ala Asp Phe Val Gly
                85                  90                  95

Glu Asp Asp Leu Val Ala Lys Ile Asn Asp Gly Trp Leu Asp Phe Asp
            100                 105                 110
```

```
Val Val Ile Ala Thr Pro Asp Met Met Ala Leu Val Gly Arg Leu Gly
        115                 120                 125

Arg Val Leu Gly Pro Arg Asn Leu Met Pro Asn Pro Lys Thr Gly Thr
    130                 135                 140

Val Thr Met Asp Val Ala Lys Ala Val Glu Glu Ser Lys Gly Gly Lys
145                 150                 155                 160

Ile Thr Tyr Arg Ala Asp Arg Ala Gly Asn Val Gln Ala Ile Ile Gly
                165                 170                 175

Lys Val Ser Phe Glu Ala Glu Lys Leu Val Glu Asn Phe Lys Ala Phe
            180                 185                 190

Asn Glu Thr Ile Gln Lys Ala Lys Pro Ala Thr Ala Lys Gly Thr Tyr
        195                 200                 205

Val Thr Asn Leu Thr Ile Thr Thr Thr Gln Gly Val Gly Ile Lys Val
    210                 215                 220

Asp Val Asn Ser Leu
225


<210>  641
<211>  620
<212>  PRT
<213>  Streptococcus pneumoniae

<400>  641

Met Asn Ile Ile Glu Glu Ile Met Thr Lys Leu Arg Glu Asp Ile Arg
1               5                   10                  15

Asn Ile Ala Ile Ile Ala His Val Asp His Gly Lys Thr Thr Leu Val
            20                  25                  30

Asp Glu Leu Leu Lys Gln Ser Glu Thr Leu Asp Ala Arg Thr Glu Leu
        35                  40                  45

Ala Glu Arg Ala Met Asp Ser Asn Asp Ile Glu Lys Glu Arg Gly Ile
    50                  55                  60
```

```
Thr Ile Leu Ala Lys Asn Thr Ala Val Ala Tyr Asn Gly Thr Arg Ile
65                  70                  75                  80

Asn Ile Met Asp Thr Pro Gly His Ala Asp Phe Gly Gly Glu Val Glu
                85                  90                  95

Arg Ile Met Lys Met Val Asp Gly Val Val Leu Val Val Asp Ala Tyr
            100                 105                 110

Glu Gly Thr Met Pro Gln Thr Arg Phe Val Leu Lys Lys Ala Leu Glu
        115                 120                 125

Gln Asp Leu Val Pro Ile Val Val Val Asn Lys Ile Asp Lys Pro Ser
    130                 135                 140

Ala Arg Pro Ala Glu Val Val Asp Glu Val Leu Glu Leu Phe Ile Glu
145                 150                 155                 160

Leu Gly Ala Asp Asp Asp Gln Leu Asp Phe Pro Val Val Tyr Ala Ser
                165                 170                 175

Ala Ile Asn Gly Thr Ser Ser Leu Ser Asp Asp Pro Ala Asp Gln Glu
            180                 185                 190

Ala Thr Met Ala Pro Ile Phe Asp Thr Ile Ile Asp His Ile Pro Ala
        195                 200                 205

Pro Val Asp Asn Ser Asp Glu Pro Leu Gln Phe Gln Val Ser Leu Leu
    210                 215                 220

Asp Tyr Asn Asp Phe Val Gly Arg Ile Gly Ile Gly Arg Val Phe Arg
225                 230                 235                 240

Gly Thr Val Lys Val Gly Asp Gln Val Thr Leu Ser Lys Leu Asp Gly
                245                 250                 255

Thr Thr Lys Asn Phe Arg Val Thr Lys Leu Phe Gly Phe Phe Gly Leu
            260                 265                 270

Glu Arg Arg Glu Ile Gln Glu Ala Lys Ala Gly Asp Leu Ile Ala Val
        275                 280                 285
```